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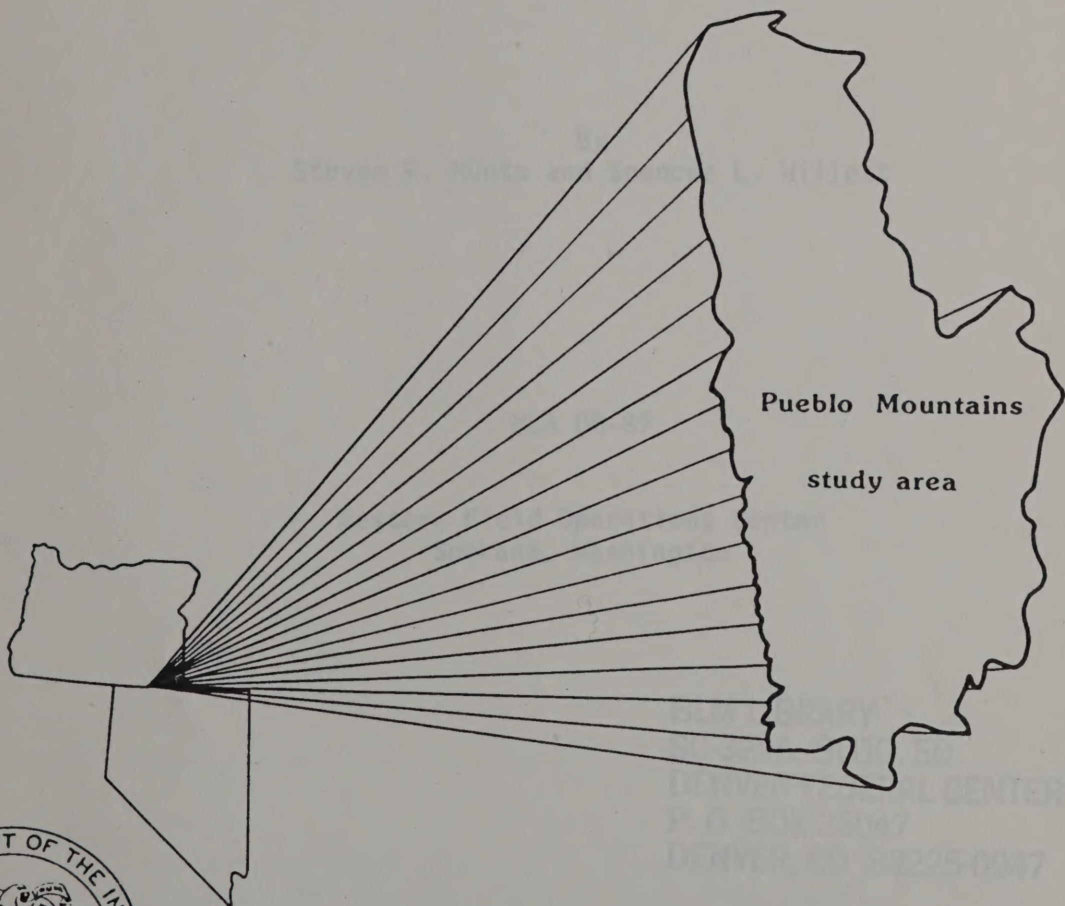
Open File Report

Mineral Resources of the Pueblo Mountains Study Area, Harney County, Oregon, and Humboldt County, Nevada



BUREAU OF MINES

UNITED STATES DEPARTMENT OF THE INTERIOR

MINERAL RESOURCES OF THE PUEBLO MOUNTAINS STUDY AREA, HARNEY COUNTY, OREGON AND HUMBOLDT COUNTY, NEVADA

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PREFACE

The Federal Land Policy and Management Act (Public Law 94-579, October 21, 1976) requires the U.S. Geological Survey and U.S. Bureau of Mines to conduct mineral surveys on U.S. Bureau of Land Management administered land designated as Wilderness Study Areas ". . . to determine the mineral values, if any, that may be present. . . ." Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a Bureau of Mines mineral survey of a portion of the Pueblo Mountains Wilderness Study Area (OR-002-81/NV-020-642), Harney County, OR, and Humboldt County, NV.

This open file report will be summarized in a joint report published by the U.S. Geological Survey. The data were gathered and interpreted by U.S. Bureau of Mines personnel from Western Field Operations Center, East 360 Third Avenue, Spokane, WA 99202. The report has been edited by members of the Branch of Mineral Land Assessment at the field center and reviewed at the Division of Mineral Land Assessment, Washington, DC.

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SUMMARY

In 1984, at the request of the U.S. Bureau of Land Management, the U.S. Bureau of Mines studied 41,315 acres of the 72,690-acre Pueblo Mountains WSA (Wilderness Study Area), in order to evaluate its mineral resources. No mines were operating in or near the 41,315-acre SA (study area) as of 1984. The Pueblo group east of the study area has produced some mercury and minor gold. The Victor group, especially the Rabbit Hole mine, northeast of the SA, has also produced small quantities of mercury. There is no recorded placer gold production from the Pueblo Mountain mining district and vicinity. At least 628 lode and 4 placer claim locations occur in and within about 1 mile of the SA. Of these, 67 are in the SA. Three-hundred eighty of the 632 claims were actively held in 1984, 20 of these were wholly or partly inside the SA. At least one area near the SA was explored by private industry in 1984 for low grade, large tonnage gold deposits.

Eleven metallic and nonmetallic commodities were investigated. These included copper, gold, mercury, molybdenum, diamonds, semiprecious gemstones, basalt, diatomite, sand and gravel, stone, and zeolites. No resources of these commodities were identified at properties in or near the study area. The predominant occurrences in and near the SA contain gold and mercury in both vein and large, low grade occurrences, and copper and molybdenum in low grade, large tonnage occurrences. The mercury and gold appears to be related to a range front fault zone on the east side of the Pueblo Mountains; gold, copper/molybdenum, and mercury in and near the southeast part of the study area are spatially related to a multiphase felsic complex. Prospects in these two environments are likely to continue to be targets of future exploration, particularly for gold. Other mineral commodities (except diamonds and semiprecious gems) are too far from markets to be of economic significance.

INTRODUCTION

The Pueblo Mountains WSA encompasses approximately 72,090 acres in the south-central portion of Harney County, Oregon, and 600 acres in Humboldt County, Nevada. This report is based on an evaluation of 41,315 acres, referred to as the SA. The study was a cooperative study with the USGS (U.S. Geological Survey). The Bureau examined and evaluated mineral resources at known mines, prospects, and mineralized areas, and the USGS performed areal geological, geochemical, and geophysical investigations.

Setting

This SA is in the northern Great-Basin in the Pueblo Mountain Range, south of Steens Mountain and west of the Alvord Desert. The nearest community, Denio, Nevada, is 5 mi (miles) southeast of the SA (fig. 1). Elevations range from 5,200 ft (feet) on the west edge to 8,632 ft at the top of Pueblo Mountain. The SA is in an arid to semi-arid high desert environment; sage brush is the dominant ground cover vegetation, although locally, in the more mountainous areas, some ponderosa pine and native grasses grow in or near creek beds.

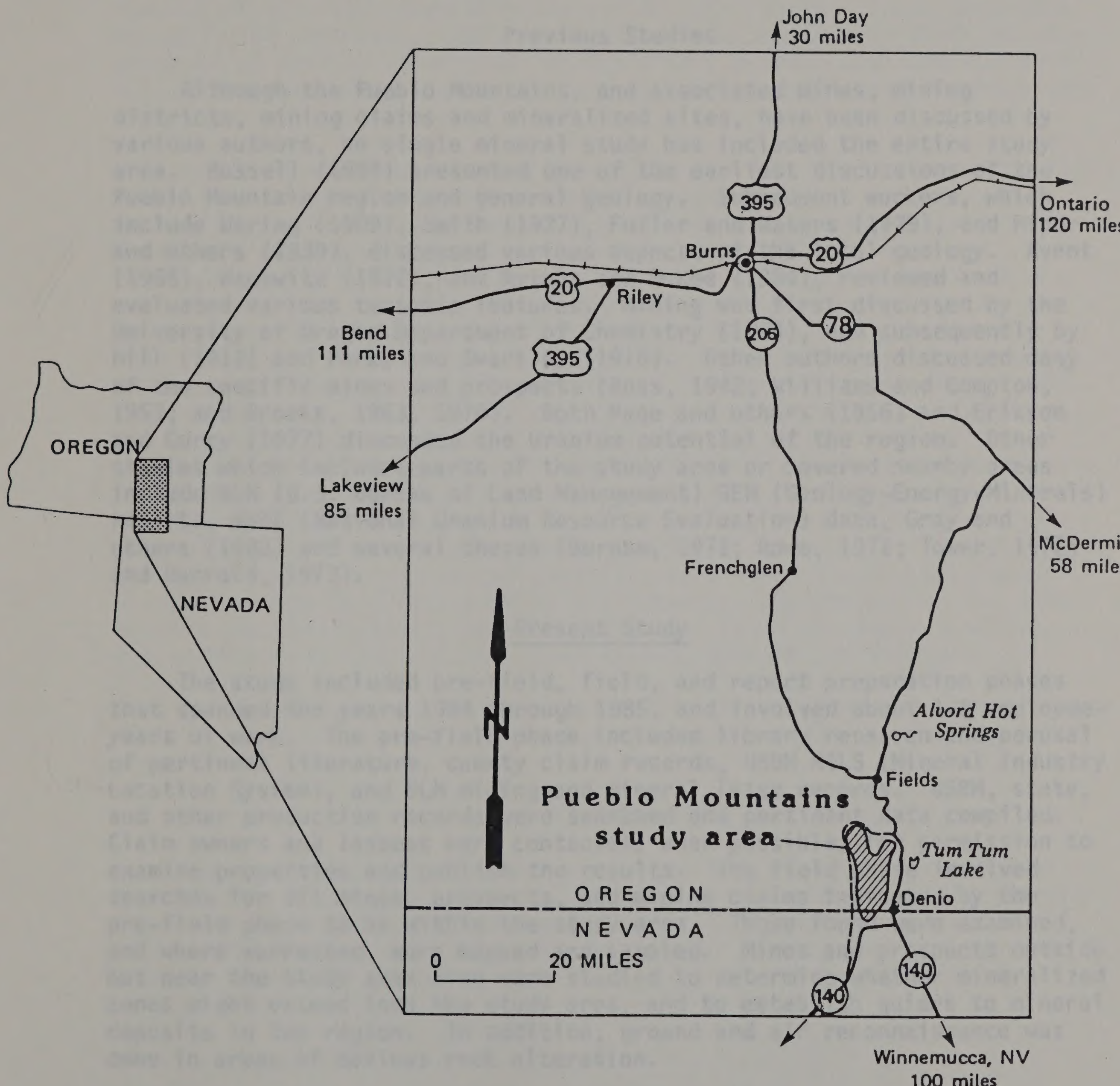

FIGURE 1. – Location map of the Pueblo Mountains study area, Oregon and Nevada

Principal vehicle access is from Burns, OR, by either State Highways 205 or 78 and associated gravel roads, or north from Winnemucca, NV through Denio, NV, by State Highway 140. A BLM access road parallels part of the northern boundary. Primitive desert roads provide limited access to the study area.

Previous Studies

Although the Pueblo Mountains, and associated mines, mining districts, mining claims and mineralized sites, have been discussed by various authors, no single mineral study has included the entire study area. Russell (1884) presented one of the earliest discussions of the Pueblo Mountain region and general geology. Subsequent workers, which include Waring (1909), Smith (1927), Fuller and Waters (1929), and Piper and others (1939), discussed various aspects of the local geology. Avent (1965), Wackwitz (1972), and Rytuba and McKee (1984), reviewed and evaluated various tectonic features. Mining was first discussed by the University of Oregon Department of Chemistry (1904), and subsequently by Hill (1912) and Parks and Swartley (1916). Other authors discussed many of the specific mines and prospects (Ross, 1942; Williams and Compton, 1953; and Brooks, 1963, 1978). Both Page and others (1956) and Erikson and Curry (1977) discussed the uranium potential of the region. Other studies which included parts of the study area or covered nearby areas include BLM (U.S. Bureau of Land Management) GEM (Geology-Energy-Minerals) reports, NURE (National Uranium Resource Evaluation) data, Gray and others (1983) and several theses (Burnam, 1971; Rowe, 1971; Tower, 1972; and Harrold, 1973).

Present Study

The study included pre-field, field, and report preparation phases that spanned the years 1984 through 1985, and involved about 1.5 employee-years of work. The pre-field phase included library research and perusal of pertinent literature, county claim records, USBM MILS (Mineral Industry Location System), and BLM mining and mineral lease records. USBM, state, and other production records were searched and pertinent data compiled. Claim owners and lessees were contacted, when possible, for permission to examine properties and publish the results. The field phase involved searches for all mines, prospects, and mining claims indicated by the pre-field phase to be within the study area. Those found were examined, and where warranted, were mapped and sampled. Mines and prospects outside but near the study area also were studied to determine whether mineralized zones might extend into the study area, and to establish guides to mineral deposits in the region. In addition, ground and air reconnaissance was done in areas of obvious rock alteration.

Two hundred forty rock, 28 alluvial, and 13 soil samples were collected. Of these, 195 were collected at mines, prospects, and mining claims. The remaining 45 rock samples were collected at mineralized sites. Rock samples were collected by the following methods: chip, a regular series of rock chips taken in a continuous line across a mineralized zone or other exposure; random chip, an unsystematic series of chips taken from an exposure of apparently homogeneous rock; grab, rock pieces taken

unsystematically from a dump, stockpile, or of float (loose rock lying on the ground); and select, pieces of rock generally chosen from the apparently best mineralized parts of a pile or exposure, or of any particular fraction (for example, quartz or host rock). Only chip samples were used for quantitative estimates of tonnage and average grade. Grab samples of alluvium, generally one or two level 14-in. (inch) gold pans of surficial sand and gravel, were concentrated on site to check for the presence of gold or other heavy minerals in placers. Soil samples were taken from the B, or subsoil, horizon and the minus 80 mesh fraction was analyzed.

Rock samples were analyzed for gold and silver by fire-assay or fire assay-inductively coupled plasma methods. Quantitative analyses of identified or suspected elements of possible economic significance were determined by atomic absorption, colorimetric, radiometric, x-ray fluorescence, or other quantitative method. At least one sample from each locality was analyzed for 40 elements 1/ by semi-quantitative spectroscopy to detect unsuspected elements of possible significance; those elements in anomalous concentrations were then analyzed by one of the quantitative methods. In this report (unless otherwise stated) the term "anomalous" is defined as any value above the detection limit for a given element and analytical method (Appendix). Six petrographic samples were examined to identify selected rock types, alteration suites, and mineral assemblages. Alluvial samples, were further concentrated on a laboratorysize Wilfley table. Resulting heavy mineral fractions were scanned with a binocular microscope to determine heavy mineral content; when gold was detected, larger particles were hand-picked and weighed along with fine gold recovered by amalgamation. Concentrates were also checked for radioactivity and fluorescence. Detailed sample results are available at WFOC, E. 360 Third Avenue, Spokane, WA 99202.

Proton magnetometer surveys were conducted at some sites to determine if major mineral bearing structures exhibited specific or characteristic signatures.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the help of several individuals from the Burns, Oregon, Bureau of Land Management office including George Brown who provided information on logistics and property owners. Boies Hall of FMC Corporation, Reno, Nevada, provided information on specific prospects adjacent to the SA.

1/ Aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, calcium, chromium, cobalt, copper, gallium, gold, iron, lanthanum, lead, lithium, magnesium, manganese, molybdenum, nickel, niobium, phosphorus, palladium, potassium, platinum, scandium, silicon, silver, sodium, strontium, tantalum, tellurium, tin, titanium, vanadium, yttrium, zinc, and zirconium.

GEOLOGIC SETTING

Rock Types

The Pueblo Mountains SA is in the northern end of the Basin and Range Province, a region characterized by north-trending fault-block mountains and basins with internal drainage. Some of the mountains are horsts with internal basins; others, including the Pueblo Mountains, are tilted fault blocks. Some intermontane basins contain playas or playa lakes which are filled by both Quaternary and older sediments and may include occurrences of diatomite and evaporites. The surrounding mountains are composed of intermediate to felsic volcanic flows and pyroclastic deposits, intermediate to felsic intrusive rocks, sedimentary rocks including sandstone and conglomerate, and metamorphic rocks including schist, phyllite and greenstone.

Rocks within the study area primarily include Tertiary and younger volcanics with some sediments, sedimentary rocks, and metamorphic rocks (fig. 2). Williams and Compton (1953) describe six geologic units in the Pueblo Mountain Range. These are, from oldest to youngest: pre-Tertiary metamorphic rocks, Alvord Creek Formation, Pike Creek Formation, Steens Mountain Volcanics, rhyolite intrusive rocks and Quaternary sediments. Other investigators divided this same sequence into different groups (Walker and Repenning, 1965) producing overlapping group names and rock groups. This discussion and figure 2 represent a summary of work from multiple sources.

The pre-Tertiary metamorphic rocks are composed of dark gray mica schists, metamorphosed limestones, and greenstones. Rocks of the Alvord Creek Formation include chiefly light colored silicic tuffs, with some claystone, sandstone and conglomerate, and rhyolite flows. The Pike Creek Formation includes rhyolite and dacite with interbedded tuffs, ash flow tuffs, and tuff breccias. Unconformably overlying this formation are thin flows of andesite, basalt, columnar jointed andesite and thin beds of volcaniclastic rocks of the Steens Mountain Andesite "Series" (Fuller, 1931). Williams and Compton (1953) expanded this volcanic "Series" to include dacitic and rhyolitic flows. The Steens Basalts Formation consists primarily of thin flows of olivine basalts which unconformably overlie earlier rocks. Many of these lithologies are cut by either dacite dikes, rhyolite intrusives, or mafic intrusives. Both alluvium and colluvium locally cover parts of these units.

Structures

Several structural features are expressed in the Pueblo Mountains SA. The mountains are formed by a series of normal faults that trend north and northwest and dip eastward. These faults created fault blocks that dip gently westward with prominent escarpments along their east side. Displacement along these faults began in the late Pliocene and down dip displacement is estimated by Williams and Compton (1953, p. 34) to be 7,000 to 10,000 ft. In addition, Rytuba and McKee (1984, p. 8618) described a subsidence feature, the Pueblo Caldera, along the east scarp of the Pueblo Mountains.

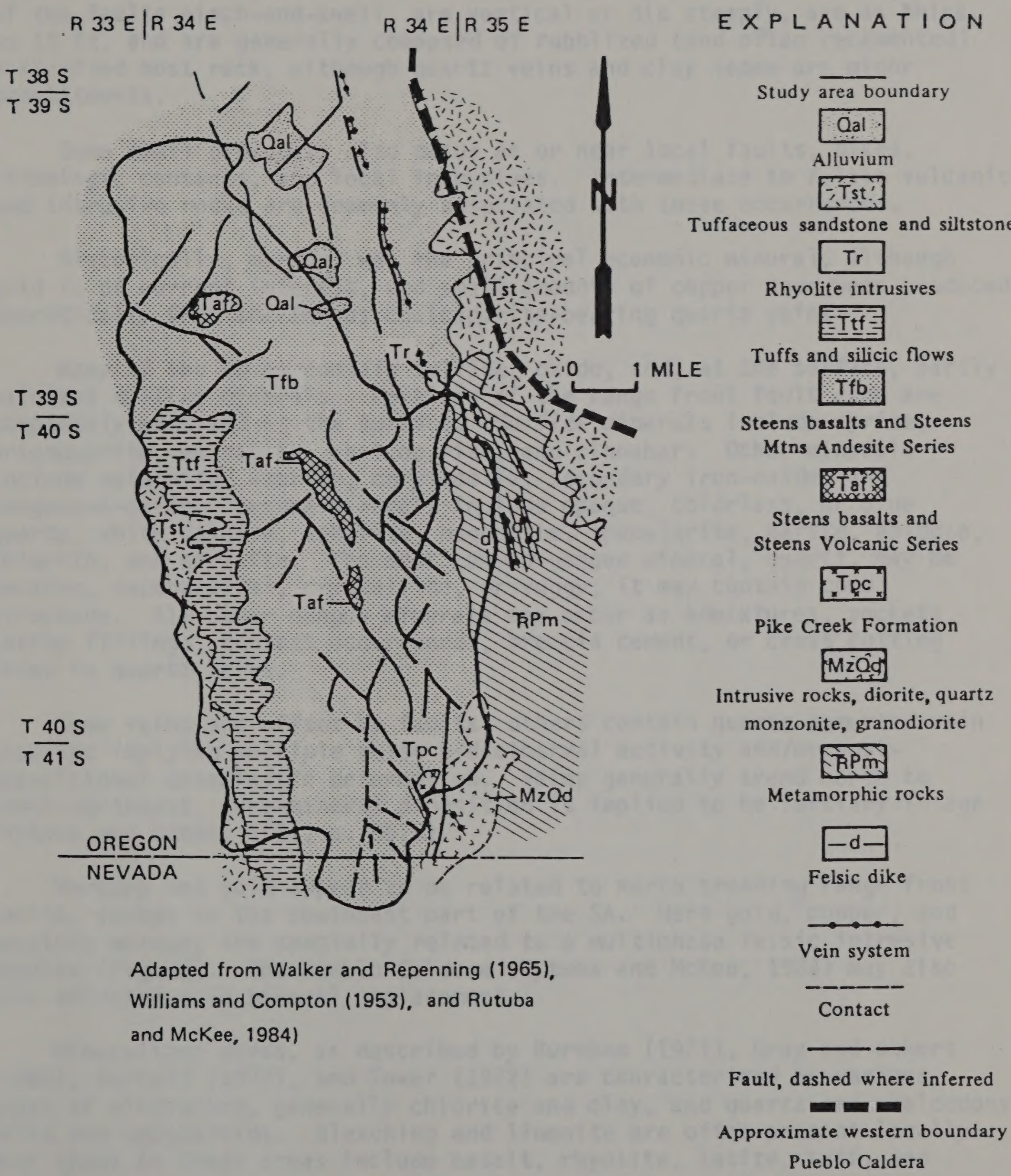

FIGURE 2. – Geologic map of the Pueblo Mountains study area, Oregon and Nevada

Mineral Deposits and Occurrences

Most lode mines and prospects in and near the study area are associated with a major, north-trending silicified fault zone, or associated en echelon faults. These faults occur in and along the eastern edge of the SA and extend north for approximately 10 mi (fig. 2). Many of the faults pinch-and-swell, are vertical or dip steeply, are as thick as 15 ft, and are generally composed of rubblized (and often recemented) silicified host rock, although quartz veins and clay seams are minor constituents.

Some small prospects also occur at or near local faults, dikes, lithologic contacts, and local intrusives. Intermediate to felsic volcanic and intrusive rocks are commonly associated with these occurrences.

Historically, mercury was the principal economic mineral, although gold is of current interest, and small amounts of copper have been produced sporadically from auriferous chalcopyrite-bearing quartz veins.

Many of the veins contain sulfide, oxide, and, at the surface, partly oxidized sulfide minerals. Portions of the range front fault zone are completely oxidized at the surface. Sulfide minerals include pyrite, arsenopyrite, marcasite, chalcopyrite, and cinnabar. Other minerals include malachite, azurite, chrysocolla, secondary iron-oxide, and manganese-oxide. Gangue minerals include opaque, colorless, or blue quartz, white calcite, ankerite, magnetite, specularite, barite, epidote, chlorite, and sericite. The most common gangue mineral, quartz, may be massive, saccharoidal, crystalline, or vuggy; it may contain comb structure. All other gangue minerals may occur as admixtures, pockets, cavity fillings, contact occurrences, breccia cement, or cross cutting veins in quartz veins.

Some veins are offset by faults; others contain quartz-cemented vein breccias implying multiple pulse hydrothermal activity and/or post-depositional cataclastic deformation. Veins generally trend north to north-northeast. Ore-mineral deposition is implied to be Tertiary in age (Rytuba and McKee, 1984, p. 8618).

Mercury and gold appear to be related to north trending range front faults, except in the southeast part of the SA. Here gold, copper, and possibly mercury are spatially related to a multiphase felsic intrusive complex (fig. 2). The Pueblo Caldera (Rytuba and McKee, 1984) may also have affected vein mineral emplacement.

Mineralized areas, as described by Burnham (1971), Gray and others (1983), Harrold (1973), and Tower (1972) are characterized by various types of alteration, generally chlorite and clay, and quartz and chalcedony veins and amygdaloids. Bleaching and limonite are often present locally. Rock types in these areas include basalt, rhyolite, latite, tuff, and mafic intrusives.

Other commodities known to occur in and near the study area include diatomite (Wagnar, 1965) and semiprecious gemstones (agate). Diatomite occurs in thin beds interlayered with volcanic ash about 1 mile northwest of the study area. Moss agate occurs in quartz and chalcedonic vein systems and clear agate in amygdules in vesicular and scoriaceous basalt flow tops.

In addition to gold, copper, mercury, and semiprecious gemstones, commodities investigated during this study include diatomite, molybdenum, basalt, diamonds, geothermal energy, oil and natural gas, stone, sand and gravel, and zeolites.

MINES, PROSPECTS, CLAIMS, AND MINERALIZED AREAS

Mining History

Harney County claim records indicate at least 628 lode and 4 placer claims have been located within the Pueblo Mountain Range area to date. Three-hundred eighty lode claims were active in the Pueblo Mountain Range and 20 of the 70 lode claims that have been located in the study area are active (1984). Current BLM records indicate that about half the study area is leased for oil and gas.

Two major periods of mining activity occurred in the Pueblo Mountain Range. The first recorded lode mining activity within or near the SA was by M. J. O'Conner and L. Denio, who located the Illinois gold claim on Mineral Creek (exact location unknown) in March 1894. By 1900, 19 lode claims had been located in the Denio Basin area and, although considerable placer exploration had occurred, only one placer claim had been filed. During the next ten years, approximately 150 lode claims were filed in the Pueblo Mountains and the Pueblo Mountain (also known as the Pueblo) mining district was formed. Most of the claims were for gold; a few were located for copper. By 1910, activity had decreased dramatically with only about 67 lode and 3 placer claims filed during the next 60 years. Most of these claims were located for mercury. During the 1970's, at least 63 claims were located in the eastern Pueblo Mountains, primarily for gold. However, during the mid-1970's, the Denio Creek area was examined and drilled by a major exploration company looking for a porphyry copper deposit. Increasing gold prices stimulated precious metal interest and more than 300 claims were filed in the eastern Pueblo Mountains between 1980 and 1982 by Inspiration Copper Company and FMC Corporation. Other exploration companies which have evaluated this area recently include Amoco Minerals, Manville corporation, and Molycorp, Inc. To date no claims have been patented.

Only minor placer mining activity has occurred in and near the SA since the early 1900's. All four placer claims recorded since 1900 are outside the SA.

The Pueblo Mountain Range area has experienced minor exploration for non-metallic commodities, including zeolites. One site on the northeast edge of the mountain range was reportedly briefly mined for zeolites.

No mineral production is recorded from within the study area. Within the Pueblo Mountain mining district, three mines have recorded production. The Pueblo mine [now part of the Pueblo (Farnham) group] has produced both gold and mercury (Brooks, 1963, p. 202). Approximately one flask of mercury was produced from the Rabbit Hole mine (now part of the Victor group). The Denio Basin group and the Sulfide group appear to have had minor production although none is officially reported. No significant placer gold production (less than 1 troy oz) is reported. Total district production is estimated to be less than 500 lbs of mercury and less than 25 oz of gold.

Sites Examined

Sixty-seven mines, prospects, and mining claim groups were examined during this study (plate 1, table 1). Sixteen groups are inside or partly inside, and 51 are outside the SA. These groups are composed of one or more claims which may be active or non-active. Only three of the latter group (plate 1, nos. 15, 57, and 58) may extend into the SA. Analyses of rock samples taken from mineralized areas (plate 2) and alluvial samples collected from creeks draining the area (plate 3) are given in the table 2 and table 3, respectively. Examination of individual sites and analyses of samples were designed to establish the presence of commodity resources for all but oil and natural gas, and geothermal energy. Identified resources have been classified according to USGS Circular 831.

APPRAISAL OF MINERAL RESOURCES

Significant metallic and nonmetallic commodities that occur within or near the SA include mercury, gold, copper, basalt, gemstones, stone, and sand and gravel. Of the 67 mines and prospects in and near the study area (located for mercury, gold, or copper), 16 occur within the SA. These mines and prospects occur in a north-northwest trending mineralized range front fault zone that contains varying local concentrations of mercury and gold. This trend is currently being evaluated by several major exploration companies for large tonnage disseminated gold deposits. Surface exposures of large, low grade occurrences of gold, copper/molybdenum and mercury mainly in the southeast corner of the SA, and small, high grade deposits, mainly on the east side of the SA may also continue as exploration targets. However, none of the mines and prospects appear to have resources, and indicated grades of exposed rock are not within limits which can currently be mined on a large scale, for gold, mercury, molybdenum or copper.

All four placer prospects examined are adjacent to the study area and were evaluated with grab samples of alluvium. Gold values in two samples were \$0.008 and \$0.01/yd (plate 1, table 1, nos. 25 and 17, respectively) (at a gold price of \$300/oz): none of the claims contained more than 100 yd^3 of gravel. Because of the low grade and volume, these prospects do not contain identified resources.

LIST OF LODE AND PLACER CLAIMS OR CLAIM GROUPS IN AND ADJACENT TO THE PUEBLO MOUNTAINS STUDY AREA
(plate 1, table 1)

1. Black Dog group
2. B and H claim group
3. Red Oxide group
4. Black Beauty
5. Raven
6. King Coal
7. Freeman Dorsey
8. Star
9. Cash-Willow Creek group
10. Stumblebum
11. Star of the West
12. Glow 1 and 2
13. Chukar group
14. Victor group
15. Arizona group
16. Arizona Copper group
17. White Horse group (placer)
18. Quail
19. Irenes group
20. Lone Star
21. King Copper
22. Whale
23. Big Bad John-Willies groups
24. Unknown
25. Pueblo group (placer)
26. Pueblo (Farnham) group
27. Grace
28. Blue Bird group (placer)
29. Unknown
30. Ace group
31. Mohawk claim
32. Shamrock
33. Robert Smith
34. Unknown
35. Climax
36. Unknown
37. Pueblo claim
38. Bonanza claims
39. Ethel May
40. Lucky Dane claims
41. Colony Creek
42. Viqueen
43. Mammoth No. 1
44. Coyote Rob
45. Monolith
46. Coyote Roy
47. Keystone
48. Lone claim
49. Viking claim
50. Pueblo Prospect
51. Unknown
52. F & G claims
53. White Elephant claim
54. Golden No. 1 claim
55. Blue Jay claim
56. Van Horn claim
57. Two Friends claim
58. Pearl Mine
59. Unknown
60. Missouri group (placer)
61. Denio Basin group
62. Unknown
63. Gray Eagle
64. Unknown
65. Unknown
66. Denio Mtn. Iron
67. Sulfide group

Walker and Repenning (1965) and Williams and Compton (1953) (fig. 2) have mapped basalt in much of the western part of the SA. Field work done during the course of this study indicates that locally, the basalt may form layers 4 to 10 in. thick, which are divided by parting planes. These tabular layers may be suitable for flagstone, slabstone, or decorative stone. However, vesicle content is too low for a high quality product. The basalts contain 15.5 percent to 16.9 percent alumina, and are in the high alumina category (Hart and others, 1984). Basalts of this type are suitable for basalt fiber manufacturing (Subramanian, 1978). Current development of the basalts for aluminum or basalt fiber is unlikely because higher quality materials are available closer to each potential market.

Three small (<1/4 mile in diameter) mafic-appearing plugs and surrounding creek drainage sediments on the western slopes of the Pueblo Mountains were examined for diamonds and traditional diamond indicator minerals. Neither were found. No favorable host rock occurrences such as kimberlites or ultramafics were identified within the SA.

An alternating layered diatomite and volcanic ash sequence was noted by Wagnar (1965). Field examination of an area about 1 mi northwest of the SA (plate 1, no. D) revealed several tuffaceous units with relatively thin (<25 ft), clay- and silt-rich, diatomaceous interbeds. A sample from the lower bed contained less than 5 percent diatoms, and one from the upper bed (50 ft above the lower bed) contained 90 percent ash and 10 percent diatoms. Based on guidelines described by Kadey (1983), these beds contain insufficient diatomite and are too thin to be considered a resource.

None of the occurrences of chalcedony and agate in the study area represent a resource; however, they may be of importance as collecting areas for local rockhounds and gemstone collectors.

Several hot springs occur both (10 mi) north and (5 mi) south of the study area, and have been evaluated by Mariner and others (1975) for their trace element content. All springs contain trace amounts of copper and mercury in surface waters. The northeast part of the Pueblo Mountains is classified as an area known or inferred to be underlain, at a shallow depth, by ". . . thermal water of sufficient temperature for direct heat application . . ." (Gray and others, 1983, p. 80). Gray and others (1983) evaluated the mineral resources of the larger wilderness study area. They found that,

> "A warm spring (Pedro Spring) near Fields about 10 miles north of the study boundary has a temperature of 32 °C and a flow rate of about 100 l/m [sic] 1/. A mineral exploration hole in sec. 13, T. 39 S., R. 34 E., when measured for geothermal gradient by the Oregon Department of Geology and Mineral Industries, showed a temperature of 35 °C at a depth of 380 m. The temperature gradient of this well was measured at 60°/km. From all indications this wilderness study area should have a high potential for geothermal energy."

1/ should be l/min.

No geothermal resources were identified in the SA.

A petroleum study by Warner (1980, p. 327) examined known pertinent geology of the Alvord Valley and vicinity and concluded that the area was a "prime exploration target" for oil and gas. Conversely, a study by Newton (1982, p. 17) indicated the Alvord Valley, had a "low favorability" for economic concentrations of oil. The study area is not known to contain thick accumulations of sedimentary rocks or structures typically associated with hydrocarbon traps and no oil and gas resources were identified.

Gneissic outcrops in the Pueblo Mountain study area are suitable for rubble stone or flagstone. Gneiss crops out in Denio Canyon along Denio Creek for at least 2,000 ft. Cliffs are as high as 200 ft and spall into cliff base talus slopes. Individual talus fragments are as thick as 4 in., and as large as 6 ft^2 in surface area. Pieces are generally rectangular to triangular and vary in color from dark gray to orange. Orange-colored rock contains clay and weathers more easily than the unaltered gray variety.

This material meets the general criteria for rubble and rough construction stone and flagstone, as described by Power (1983). However, the altered variety appears to be less suitable. This occurrence is not economic (currently) because of a lack of nearby markets. However, this area could be developed to supply construction stone for local use.

Small occurrences of mixed sand and gravel occur both in and adjacent to the SA. All are alluvial, and occur in Dip, Rincon, Willow, and Arizona Creeks. They are generally wedge shaped in cross-section, as wide as 20 ft and as thick as 10 ft. At the confluence of Dugout and Dip Creeks, a small (less than 1 acre) ocurrence of pebble- to boulder-rich material is preserved. However, it contains up to 40 percent soil in surface exposure. None of these occurrences appear to be economic, as larger and better quality deposits occur closer to major market areas; however, they could support local use.

An occurrence of zeolites 3 mi northeast of the study area (Gray and others 1983, p. 80), was explored by extensive bulldozer scrapes. Although the prospect appears to have supported minor but unrecorded production, both chemical field tests and laboratory XRD (x-ray defraction) analysis failed to detect any zeolites. The host rocks could not be traced into the study area.

RECOMMENDATIONS FOR FURTHER WORK

Although not all are inside the study area, the Pueblo Mountain Range contains three areas which warrant further geologic, geochemical and geophysical study and drilling if warranted.

1. Nearby thermal hot springs (Mariner and others, 1975), minor reported occurrences of uranium (Erikson and Curry, 1977), detectable gold in basalt cap rock (plate 2 and table 2, no. 20, 21, 23, 27, 30 and 31), and a series of mercury occurrences (table 2, plate 1, no. 14, 26, and 61) in and adjacent to the eastern part of the study area, may be

indicators of epithermal precious metal deposits. The mercury-producing belt along the eastern flank of the Pueblo Mountain Range should be considered for site specific studies. Gold was detected in five samples along the western slope of the Pueblo Mountain Range (fig. 4, table 2, no. 6, 8, 11, 12, and 24). Detectable gold, occasional alteration (fig. 4, no. 11), and a granodiorite intrusive (fig. 4, no. 24) may be indicators of precious metals resources.

Because of the proximity of the Pueblo Caldera (Rytuba and McKee, 1985), this area may also contain uranium, lithium, and molybdenum resources. These metals should be considered when designing any evaluation program for this area.

2. Denio Creek, less than 1 mi outside the SA, is the site of extensive hydrothermal alteration of metamorphic rocks, surficial copper minerals, and nearby granodiorite. These features can be indicators of porphyry copper-type resources. Metamorphic units should be examined for a porphyry copper resource and gold and base metal occurrences, which may or may not be associated with the nearby intrusive rocks.

3. A series of tuffaceous rocks are exposed in the western foothills of the Pueblo Mountain Range, in the southwest part of the SA. These rocks are at least locally altered to clay (table 2, plate 2, no. 38). Evaluation of this area should include geologic mapping and detailed sampling for clay and zeolite minerals, and possibly precious metals.

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APPENDIX

TABLE 1.--Mines, prospects, mining claims, and claim groups in and adjacent to the Pueblo Mountains study area, Oregon and Nevada

[Asterisk (*) indicates outside study area]

Map no. (plate 1)	Name (commodity)	Summary	Workings and production	Sample and resource data
1	Black Dog group	Occasional chalcedonic and opaque to clear quartz veins cut andesite and vesicular basalt flows. Vein and veinlets trend N. 45° W. and dip 75° to 85° SW., are generally <1/4 in. thick, and appear to be discontinuous. Limonite occurs only where the host rocks are intruded by a gabbroic body. Host rocks show weak chloritic alteration.	No workings.	One random chip sample contained no gold or silver.
2	B and H claim group	A thin (<3 in.) malachite-rich quartz vein cuts basalt. Zeolites occur as amygdaloids in vesicular portions of the basalt. A trace of malachite was found on basalt float.	One 11-ft-deep pit.	Four grab samples of basalt with a trace of quartz. Gold values ranged from <0.007 to 0.008 ppm; silver values were <0.3 ppm; barium ranged from <0.01 to 0.08%; zinc was <2 to 110 ppm; copper ranged from <5 to 250 ppm, and arsenic was <2 to 110 ppm.
*3	Red Oxide group	Vesicular basalt contains clear to opaque quartz amygdaloids in scoriaceous flow tops. some quartz is banded and appears chalcedonic.	No workings.	One grab sample of diorite contained <0.007 oz/ton gold, <0.3 oz/ton silver, 12 ppm arsenic and 28 ppm molybdenum.
4	Black Beauty	No veins exposed on the surface. Diorite and basalt show only minor chloritic alteration and are weakly bleached near some fractures.	No workings.	One grab sample of diorite contained <0.007 oz/ton gold, <0.3 oz/ton silver, 120 ppm zinc, 97 ppm copper, 4.3 ppm molybdenum, 0.03% vanadium, 82 ppm arsenic, and 0.03% barium.
5	Raven	Diorite and basalt dislay limonite in some fractures.	No workings.	One grab sample of basalt and diorite contained no gold or silver, 100 ppm zinc, and 85 ppm copper.
*6	King Coal	Pit exposes two vitrophyric ignimbrite units, separated by a 2-ft-thick red clay-rich zone, which overlie a vesicular basalt. The flow-banded lower unit is gray to black with occasional pumice clasts; the upper unit is dark gray to green vitrophyre.	One large pit (15 ft by 25 ft by 14 ft high).	One 12-ft-long chip sample of gray to black ignembrite contained no gold or silver.
7	Freeman Dorsey	Crystalline basalt with minor surficial iron oxide.	Small pit.	One 2 ft chip sample contained no gold or silver, 24 ppm mercury, 54 ppm arsenic, 0.15% barium, and 49 ppm zinc.
*8	Star	Basalt and andesite display weak propylitic alteration and some local silicification along fractures. Some chalcedony float.	No workings	One grab sample of basalt, andesite, and chalcedony contained <0.007 oz/ton gold, <0.3 oz/ton silver, 0.12% barium, 71 ppm zinc and 3.4 ppm molybdenum.

TABLE 1.--Mines, prospects, mining claims, and claim groups in and adjacent to the Pueblo Mountains study area, Oregon and Nevada--Continued

Map no. (plate 1)	Name (commodity)	Summary	Workings and production	Sample and resource data
*9	Cash-Willow Creek Group	Chalcedony float near outcrops of propyliticaly altered andesite. Quartz occurs as rounded pieces and appears to have formed amygdaloids in vesicular flow tops.	No workings.	One grab sample of chalcedony float contained <0.007 oz/ton gold, <0.03 oz/ton silver, 83 ppm arsenic, 71 ppm zinc, 0.03% vanadium, and 0.09% barium.
*10	Stumblebum	An andesite dike strikes N. 28° E. and dips 80° E., and cuts basalt flows and lamprophyre and diabase intrusives. A trace of opaque, white quartz float was found near the dike.	No workings.	One 5-ft chip sample of dike contained <0.007 oz/ton gold, <0.3 oz/ton silver, 2 ppm mercury, 23 ppm arsenic, 0.07% barium, and 43 ppm zinc.
*11	Star of the West	An opaque white quartz vein and an opalite vein parallel a quartz porphyry dike; both cut vesicular basalt, porphyritic andesite, vitrophyre, and welded tuff. Both veins and the dike trend N. 20° W. and dip vertically.	No workings.	One grab sample of quartz and opalite material contained <0.007 oz/ton gold, <0.3 oz/ton silver, 17 ppm mercury, 0.08% barium, and 53 ppm molybdenum.
*12	Glow 1 and 2	Host rocks include silicified basalt, aplite andesite, quartzite (?), and granodiorite. Limonite occurs on fractures; silicification of host rocks is most intense near fractures. In some areas, feldspars are altered to clay and sericite; other areas display intense clay alteration of the entire host rock. A pebble breccia zone is exposed in one pit.	Two pits and one 900-ft-long bulldozer scrape on the ridge crest.	Seven grab samples of andesite and aplite. Gold values ranged from <0.007 to 0.01 oz/ton and silver values ranged from <0.03 to 0.03 oz/ton. One 6-ft chip sample of a pebble breccia zone contained <0.007 oz/ton gold and <0.3 oz/ton, 2 to 400 ppm mercury, 45 to 200 ppm arsenic, <2 to 4 ppm antimony, 0.02% to 0.15% barium, <2 to 280 ppm zinc, and <2 to 4.7 ppm molybdenum.
*13	Chukar group	Host rocks consist of basalt, local granodiorite, tuffaceous sandstone and siltstone, and conglomerates, cut by a north- to northwest-trending silicified fault zone. Host rocks are locally silicified and altered to clay and sericite. The zone is a wide as 500 ft. Magnetite, pyrite, a trace of malachite, and cinnabar occur locally in fractures.	Five shallow pits (<5 ft deep) and one 15-ft-deep shaft.	One grab sample of silicified granodiorite contained no gold or silver, 54 ppm arsenic, and 280 ppm zinc.
*14	Victor group (Rabbit Hole prospect)	Porphyritic basalt is cut by a 10- to 20-ft-thick opaque to clear white quartz vein. The vein strikes N. 30° W. and dips 50° to 70° W., and locally contains inclusions of host rock. The basalt is often silicified up to 10 ft away from vein on each side and the zone is encased in a clay and chlorite alteration envelope. Pyrite, cinnabar, and limonite occur sporadically.	Five shallow pits, and one shaft at least 75 ft deep.	Two chip and 13 soil samples. Vein chip samples contained 0.017 and <0.007 ppm gold and both <0.3 ppm silver. Soil samples ranged from <0.01 to 1.2 ppm gold, <0.7 ppm silver, 110 to 460 ppm zinc, <5 to 180 ppm copper, <2 to 3.9 ppm molybdenum, 78 to 200 ppm arsenic, <20 to 48 ppm antimony, and <5 to 6 ppm tungsten.

TABLE 1.--Mines, prospects, mining claims, and claim groups in and adjacent to the Pueblo Mountains study area, Oregon and Nevada--Continued

Map no. (plate 1)	Name (commodity)	Summary	Workings and production	Sample and resource data
*15	Arizona group	Clear and opaque white quartz veinlets strike N. 20° W. and generally dip 70° W. in greenstone and porphyritic andesite. Host rocks are bleached near veins, contain chlorite and epidote, and are partly silicified. Magnetite, pyrite, and malachite occur in some fractures.	Three shallow pits (<5 ft deep) and two bulldozer cuts.	Five chip and three grab samples. Two grab samples of dump rock contained 0.037 and 0.064 oz/ton gold, and <3 and 0.840 oz/ton silver. The third grab sample, from a quartz stockpile, contained 0.066 oz/ton gold and <0.3 oz/ton silver. These three samples also contained 0.19% to 5.2% copper. Two chip samples of greenstone (1 ft and 5 ft long) contained 0.018 and 0.040 oz/ton gold, and <0.3 oz/ton silver. Three additional chip samples of andesite ranged from 0.066 to 0.098 oz/ton gold and <0.3 to 0.370 oz/ton silver. Other values of interest for all 8 samples included: 81 to 250 ppm zinc, 99 to 400 ppm copper, and 2 to 64 ppm molybdenum.
*16	Arizona Copper group	A 6-in.-thick vein of opaque white quartz cuts porphyritic dacite. The vein strikes N. 45° E. and dips 80° S., and is cut by later milky quartz veinlets. Host rock is locally bleached, contains quartz and clay alteration, and has chlorite on some fractures. Limonite occurs only on dump rock.	One pit 3 ft deep.	Three grab and six chip samples. Grab samples of dump rock ranged from 0.037 to 0.066 ppm gold, <0.3 to 4.02 ppm silver, and 0.19 to 5.2% copper. Six-ft and 2-ft chip samples of two quartz veins, respectively, contained 0.066 and 0.081 ppm gold and <0.3 oz/ton silver. Four additional chip samples of host contained 0.018 to 0.098 ppm gold and <0.3 rock ppm silver. Other concentrations of interest for all 9 samples included 99 to 400 ppm copper and 3 ppm antimony.
*17	White House placer (placer)	Claim is located on alluvial fans and pediment. Area is cut by a small dry creek bed.	No workings.	One grab sample containing 0.00004 oz/yd^3 of gold worth $0.011/yd^3 when gold is valued at $300/troy oz.
*18	Quail	A 2-ft-thick silicified zone in dark gray porphyritic andesite trends north-northwest for approximately 100 ft, and dips vertically. The zone is bleached, silicified, and contains some clay and chlorite alteration but no visible limonite or sulfides. The claim block also covers greenstones and a rhyolite plug which are locally silicified and contain some limonite.	One pit and one 12-ft-wide, 48-ft-long dozer cut.	A 3-ft chip sample of the pit face contained 0.082 ppm gold and <0.3 ppm silver. A 2-ft chip sample of silicified andesite contained 0.121 ppm gold and <0.3 ppm silver. Other values of interest included 64 ppm zinc and 5.1 ppm molybdenum.
19	Irenes group	Quartz veins parallel dacite dikes; both cut quartz monzonite and metasedimentary rocks. En echelon, opaque white quartz veins as thick as 4 ft, trend N. 50° E. and dip 80° S., and contain sericite, a trace of pyrite, schorl (tourmaline); each vein can be traced for up to 100 ft. Both dacite and quartz monzonite show epidote, clay, sericite, and silica alteration minerals which are more abundant near veins. Limonite occurs sporadically in the host rocks.	Three pits <5 ft deep.	Two grab and six chip samples. One grab sample of metasedimentary rocks contained no gold or silver; one grab sample of quartz monzonite contained 0.014 ppm gold and <0.3 ppm silver. Five chip samples of four veins contained <0.007 to 0.008 oz/ton gold and <0.3 ppm silver. A 2-ft chip sample of dacite contained no gold and silver. Another concentration of interest was 23 ppm molybdenum.

TABLE 1.--Mines, prospects, mining claims, and claim groups in and adjacent to the Pueblo Mountains study area, Oregon and Nevada--Continued

Map no. (plate 1)	Name (commodity)	Summary	Workings and production	Sample and resource data
20	Lone Star	A 3-ft-thick, opaque, white quartz vein cuts silicified limestone and quartzite and can be traced for 40 ft. The vein trends N. 89° to 90° W. and dips 85° N., and contains only trace amounts of limonite.	One shallow (20 ft deep) shaft.	One 3-ft chip sample of vein quartz contained 4 ppm arsenic but no gold or silver.
*21	King Copper	A 2-ft-thick breccia zone cuts porphyritic andesite. The breccia is cemented with clear, chalcopyrite-bearing quartz, and strikes N. 20° E. and dips 73° E. The andesite is propylitically altered and contains minor limonite.	One pit 4 ft deep.	A 2-ft chip sample of the breccia zone contained 0.12% copper but no gold or silver.
*22	Whale	Two opaque, white quartz veins, 1 ft and 5 ft thick, cut greenstone and schist. The 1-ft-thick vein strikes N. 51° E. and dips 76° S.; the 5-ft-thick vein strikes N. 45° W. and is vertical. Both veins contain minor amounts of schorl (tourmaline) with sericite on the hanging wall contact; the walls show slickensides. The host rocks are bleached and silicified, and show sericite and clay alteration, and some limonite. Pyrite and malachite occur in trace amounts in both the veins and host rocks.	Three open cuts; all 5 ft deep.	One grab and two chip samples. A dump rock grab sample contained 0.011 ppm gold and <0.3 ppm silver. Five ft and 1 ft chip sample of quartz veins contained <0.007 and 0.010 ppm gold, respectively, and <0.3 ppm silver.
*23	Big Bad John-Willies groups	Both clear and milky quartz veins and veinlets as thick as 6 in., strike N. 60° E. and dip 70° S., and cut greenstone and a dacite dike. The host rocks show areas of silicification, clay, sericite, and tourmaline alteration, weak bleaching, and some hornfels alteration. Some magnetite and limonite occurs on fractures.	No workings.	One grab sample of host rock and one 6 ft vein chip sample: both contained as mucn as 19 ppm arsenic, 100 ppm copper, 13 ppm molybdenum, and 0.013% barium; neither sample contained gold or silver.
24	Unknown	A 3-ft-thick milky quartz vein, which can be traced for 50 ft, trends N. 53° E. and dips 75° N., and cuts porphyritic dacite. The host rock contains chlorite, epidote, and shows areas of weak silicification.	One 6 ft by 15 ft by 3 ft deep pit.	A 2-1/2-ft vein chip sample contained 0.007 ppm gold, <0.3 ppm silver, and 25 ppm molybdenum.
*25	Pueblo group (placer)	Narrow creek channel contains limited gravel concentrations.	No workings.	One grab sample containing 0.000028 oz/yd^3 of gold worth $0.008/yd^3 when gold is valued at $300/troy oz.

TABLE 1.--Mines, prospects, mining claims, and claim groups in and adjacent to the Pueblo Mountains study area, Oregon and Nevada--Continued

Map no. (plate 1)	Name (commodity)	Summary	Workings and production	Sample and resource data
*26	Pueblo (Farnham) group	Several veins cut greenstone and schist. Veins are as thick as 3 ft, trend N. 5° to 20° E. and dip 70° to 90° W., and are composed of clear to milky quartz, chalcedony, and minor opalite. Cinnabar, pyrite, malachite, and azurite occur in veins in small amounts. Host rocks are weakly bleached and show a trace of limonite and clay.	Five pits and three caved adits estimated to be as much as 260 ft long. Production includes "a few hundred pounts of quick-silver . . ." (Brooks, 1963, p. 202) and 5.13 oz gold.	Nine grab and ten chip samples. Five host rock grab samples ranged from <0.007 to 0.028 ppm gold and <0.3 ppm silver. Four dump grab samples ranged from 0.009 to 0.019 ppm gold and <0.3 ppm silver. Chip samples of veins ranged from <0.007 to 0.076 ppm gold and <0.3 to 21.72 ppm silver. Other concentrations of interest included <2 to 135 ppm mercury, <2 ppm to 0.236% arsenic, <2.ppm to 0.43% antimony, <50 ppm to 0.083% barium, <80 to 110 ppm lead, <2 to 170 ppm zinc, 190 ppm to 2.5% copper, and <2 to 62 ppm molybdenum.
*27	Grace	Several veins cut greenstone. Veins are composed of clear to opaque white quartz, are as thick as 1 1/2 ft, and trend N. 10° E. to N. 20° E. and dip 65° to 90° E. Traces of cinnabar, pyrite, chalcopyrite, and schwatzite occur in and along the edges of the quartz veins. Occasionally calcite accompanies or occurs in place of the opaque quartz. The host rock is altered to chlorite, epidote, and clay, and silicified adjacent to the veins.	Seven pits and two shafts, and two caved adits.	Eight grab and four chip samples. Grab samples from the dump ranged from 0.01 to 17.74 ppm gold and <0.3 to 6.654 ppm silver. The four chip samples at caved portals ranged from <0.3 to 1.2 ppm gold and from <0.3 to 0.550 ppm silver. Other concentrations of interest included 13.2 to 26.4 ppm arsenic, 4 to 263 ppm antimony, 0.013% to 0.096% barium, 76 to 200 ppm zinc, 170 ppm to 0.11% copper, and 2 to 6.1 ppm molybdenum.
*28	Blue Bird group (placer)	Area is covered by eluvium with local alluvium near creeks.	No workings.	One grab sample: no gold detected.
*29	Unknown	Quartz and greenstone float near the adit and on the mine dump is moderately bleached and chloritically and argillically altered, and contains some clots of schorl (tourmaline) and occasional specularite.	One caved adit.	One grab sample of dump rock contained 0.010 ppm gold, <0.3 ppm silver, 0.34% copper, and 0.115% barium.
30	Ace group	Veins of milky quartz, as thick as 4 ft, strike N. 55° E. and dip 69° W. in dacite and greenstone; the veins can be traced for 50 ft. Host rocks are weakly bleached near veins and altered to quartz, sericite, clay, tourmaline, and minor chlorite. Limonite, chrysocolla, and a trace of cinnabar are also present.	One small (5 ft by 5 ft by 2 ft deep) pit.	Two chip and one grab sample. Neither sample contained detectable gold. One chip sample contained 0.031% barium, 100 ppm copper, and 13 ppm molybdenum.
*31	Mohawk claim	A 2-ft-thick altered zone in granodiorite strikes north-south and dips 56° W., and contains quartz, malachite, and chrysocolla.	Two small pits.	A 2-ft chip sample of altered rock contained 0.011 ppm gold, <0.3 ppm silver, and 0.33% copper.

TABLE 1.--Mines, prospects, mining claims, and claim groups in and adjacent to the Pueblo Mountains study area, Oregon and Nevada--Continued

Map no. (plate 1)	Name (commodity)	Summary	Workings and production	Sample and resource data
*32	Shamrock	Brecciated shear zones strike N. 45° E. and N. 85° W., dip 75° NW. and 55° NE., respectively, and contain white quartz veinlets in fine-grained to porphyritic andesite. The area also contains quartz, greenstone, and porphyritic andesite float. All host rock lithologies contain chalcopyrite and malachite on some fracture surfaces and as veinlets.	Seven pits ranging in length from 6 ft to 30 ft and up to 6 ft wide.	One chip and four grab samples. The 4-ft chip sample of the vain contained 0.042 ppm gold and <0.3 ppm silver. Grab samples of dump rock ranged from 0.285 to 5.954 ppm gold, <0.3 to 4.508 ppm silver, and 0.4% to 0.86% copper. Other concentrations included 5 to 26.5 ppm arsenic, 90 ppm to 0.054% lead, 140 ppm zinc, 22 ppm molybdenum, and 1.2 to 26 ppm U_3O_8.
*33	Robert Smith	Veinlets of limonite and of opaque white quartz cut fine-grained andesite and granodiorite in float.	None.	One grab sample contained 0.019 ppm gold, <0.03 ppm silver, and 0.086% barium.
*34	Unknown	Silicified, recemented breccia contain quartz, limonite, and possible hematite. Predominant rock types are porphyritic andesite, quartzite, and granodiorite.	One small pit.	Three grab samples of dump rock ranged from 0.023 to 0.106 ppm gold, <0.3 to 0.73 ppm silver; one sample contained 0.037% barium, and 0.33% copper.
*35	Climax	Pyrite-bearing quartz veins in fracture zones strike N. 40° E. and N. 62° E. and dip 62° SE. and 77° SE., respectively. Hose rocks include greenstone and andesite.	Two small pits.	Two chip samples across 3-ft and 5-ft fracture zones contained 0.017 and 0.034 ppm gold and <0.3 ppm silver; one fracture zone contained 0.142% barium. Other concentrations of interest included 7 ppm arsenic, 3 ppm antimony, and 42 ppm zinc.
*36	Unknown	Brecciated quartz vein float fragments with malachite and limonite occur with granodiorite, diorite, and andesite float.	One small pit.	One grab sample of quartz float in and around pit contained 0.078 ppm gold, <0.3 ppm silver, 0.023% arsenic, 0.002% yttrium, 0.002% ytterbium, and 0.39% copper.
*37	Pueblo claim	Silicified, altered rhyolite (?) dike rock in contact with andesite. Contact strikes N. 65° E. and dips 75° SE.	No workings.	One chip sample across 2-ft-thick dike contained 0.015 ppm gold, <0.3 ppm silver, and 0.049% barium.
*38	Bonanza claims	Two discontinuous, hydrothermally altered zones, 4 ft thick and 5 ft thick, cut porphyritic andesite. The zones strike N. 25° E. and N. 80° E., respectively, and dip vertically, and contain minor amounts of malachite and limonite. An 11-ft-thick shear zone near the face of the adit strikes N. 55° E. and dips 51° SE., and contains seams of clay.	One 80-ft-long adit and three small pits.	Seven chip samples and two grab samples. Chip samples across the hydrothermally altered zones ranged from 0.008 to 0.433 ppm gold and 1.3 to 1.788 ppm silver. Samples from two pits also contained 0.13% and 0.17% copper and up to 0.036% barium. Grab samples of quartz vein float and host rock contained 0.009 and 0.023 ppm gold, <0.3 ppm silver, 0.92% to 0.96% barium; one contained 0.11% copper.

TABLE 1.--Mines, prospects, mining claims, and claim groups in and adjacent to the Pueblo Mountains study area, Oregon and Nevada--Continued

Map no. (plate 1)	Name (commodity)	Summary	Workings and production	Sample and resource data
*39	Ethel May	Quartz vein float fragments occur with porphyritic andesite, granodiorite, and greenstone float. Small amount of specular hematite occur on some greenstone fragments.	No workings.	One grab sample of quartz vein float contained 0.095 ppm gold, <0.3 ppm silver, and 0.19% barium.
*40	Lucky Dane claims	Quartz vein float fragments occur with granodiorite, andesite, and greenstone float. Predominant rock type is green phyllite.	None.	Two grab samples of quartz vein float contained 0.019 and 0.029 ppm gold and <0.3 ppm silver.
*41	Colony Creek	A 4.5-ft-thick, silicified zone at a greenstone-andesite contact strikes N. 55° E. and dips 85° NW., and contains arsenopyrite and limonitic boxwork. The dark gray, fine-grained andesite has discontinuous quartz veinlets and minor iron oxide stains; the greenstone is dark green and silicified where exposed.	One shaft 5 ft long, 4 ft wide, and 4 ft deep.	Two chip samples and one grab sample of dump rock. Chip samples taken across the silicified zone contained 0.009 and 0.034 ppm gold, <0.3 ppm silver, and 0.013% and 0.141% barium. A select sample of quartz-rich dump rock contained 0.026 ppm gold and <0.3 ppm silver.
*42	Viqueen	Fine-grained, dark gray andesite with minor limonite.	No workings.	One grab sample of andesite float contained no gold or silver and 0.106% barium.
*43	Mammoth No. 1	Limonitic quartz vein in phyllitic host rock.	No workings.	One grab sample of quartz vein float contained 0.014 ppm gold, <0.3 ppm silver, 0.039% barite, and 130 ppm copper.
*44	Coyote Rob	Quartz vein, with limonitic and hematitic stains, in phyllitic host rock.	One pit 100 ft long and 5 ft wide.	One grab sample of quartz vein float contained 0.020 ppm gold, <0.3 ppm silver, and 0.018% barium.
*45	Monolith	Discontinuous quartz veinlets with malachite occur in an outcrop of silicified phyllite, with foliation that trends N. 45° E.	One pit 35 ft long and 6 ft wide.	One 3-ft chip sample across silicified outcrop contained 1.670 ppm gold, 2.408 ppm silver, 0.015% arsenic, and 0.57% copper.
*46	Coyote Roy	Intensely altered, silicified zone strikes N. 10° E. and dips 45°-75° SE., and extends for approximately 200 ft in phyllitic host rock. Apparent mineralization includes malachite and chrysocolla with pervasive limonite.	One pit.	Two chip samples across a 4-ft to 5-ft-thick silified zone respectively contained 0.068 and 0.065 ppm gold, 1.380 and 1.615 ppm silver, 0.103% and 0.079% arsenic, 0.035% and 0.022% antimony, 0.12% and 0.046% barium, and 1.5% and 1.3% copper.
*47	Keystone	Quartz with minor limonite and hematite stains in dark green phyllite.	No workings.	One grab sample of the float contained 0.014 ppm gold, <0.3 ppm silver, and 0.021% barium.

TABLE 1.--Mines, prospects, mining claims, and claim groups in and adjacent to the Pueblo Mountains study area, Oregon and Nevada--Continued

Map no. (plate 1)	Name (commodity)	Summary	Workings and production	Sample and resource data
*48	Lone claim	A bull quartz vein and 5-ft-thick quartz-rich zone with quartz veinlets and malachite occur in foliated schist. The 10-ft-thick massive bull quartz vein strikes N. 46° E. and dips vertically.	One small pit.	Two chip samples of the quartz vein contained 0.050 and 0.011 ppm gold, <0.3 ppm silver, 0.048%, and 0.040% barium; one sample contained 0.16% copper.
*49	Viking claim	Quartz vein contains specular hematite and limonite and cuts both unaltered and altered phyllite.	Two trenches: 100 ft long, 12 ft wide, and 50 ft long.	One grab sample of quartz vein and phyllite contained 0.024 ppm gold, <0.3 ppm silver, 0.068% barium, 10 ppm arsenic, 150 ppm zinc, and 230 ppm copper.
50	Pueblo prospect	Outcrops of dark brown basalt with malachite-coated amygdules and veinlets of calcite.	No workings.	One 4-ft chip sample of amygdaloidal basalt contained 0.032 ppm gold, <0.3 ppm silver, and 0.034% barium, 75 ppm zinc, and 130 ppm copper.
51	Unknown	Fine- to medium-grained chalcedony fragments scattered in vesicular, scoriaceous basalt float that contains xenoliths of amygdaloidal basalt.	No workings.	One grab sample of chalcedony fragments contained no gold or silver.
52	F & G claims	Outcrop of dark gray, finely crystalline, silicified andesite with minor iron oxide stains.	No workings.	One 9-ft chip sample of silicified andesite contained 0.020 ppm gold, <0.3 ppm silver, 0.040% barium, 93 ppm zinc and 150 ppm arsenic.
53	White Elephant claim	Outcrop of phyllitic greenstone with bronze-colored biotite on some fracture surfaces.	No workings.	One 4-ft chip sample of phyllitic greenstone contained 0.017 ppm gold, <0.3 ppm silver, 0.11% barium, and 42 ppm zinc.
54	Golden No. 1 claim	Outcrop of reddish rhyolite(?) with aphanitic groundmass and minute feldspar phenocrysts.	No workings.	One chip sample of volcanic rock contained 0.015 ppm gold, <0.3 ppm silver, 0.08% barium, 4 ppm arsenic, and 51 ppm zinc.
55	Blue Jay claim	Outcrop of dark gray, fine-grained, silicifed andesite.	No workings.	One chip sample of silicified andesite contained 0.016 ppm gold, <0.3 ppm silver, 0.087% barium, 240 ppm zinc and 170 ppm copper.
56	Van Horn claim	Siliceously altered fracture zone with discontinuous quartz veins and malachite. Zone strikes N. 48° E. and dips 78° E. in foliated metamorphic rocks, and is 4.0 to 5.0 ft thick and about 10 ft long.	Two small pits.	Two chip samples across fracture zone contained, in order, 0.015 ppm and 0.012 ppm gold, 3.629 and <0.3 ppm silver,<50 ppm and 0.37% copper, and 0.079% and 0.050% barium, 6 and 13 ppm arsenic, 5 ppm and 29.6 ppm antimony, and 40 and 48 ppm zinc.

TABLE 1.--Mines, prospects, mining claims, and claim groups in and adjacent to the Pueblo Mountains study area, Oregon and Nevada--Continued

Map no. (plate 1)	Name (commodity)	Summary	Workings and production	Sample and resource data
*57	Two Friends claim	Two nearly parallel, hydrothermally altered zones, 2.0 to 3.0 ft thick, with quartz veins, malachite, some chalcopyrite, and abundant limonite. The zones strike N. 60° to 65° E. and dip 48° to 60° E. in dark gray phyllite and schist.	Two small pits and one shallow inclined shaft.	Three chip samples and one grab sample. Chip samples of quartz vein and hydrothermally altered rock ranged from 0.016 to 0.194 ppm gold, 0.430 to 0.986 ppm silver, <5 ppm to 0.01% arsenic, 0.012% to 1.62% barium, and <50 ppm to 0.21% copper. The grab sample of high-grade dump rock, contained 0.068 ppm gold, 1.226 ppm silver, 2.17% barite, and 1.3% copper.
*58	Pearl Mine	Two hydrothermally altered, brecciated, intersecting fault zones, 4.5 and 5.0 ft thick, in phyllite host. The zones contain quartz veinlets and malachite; one strikes N. 60° E. and the other N. 60° W., with 60° SE. and vertical dips, respectively.	One pit.	Two chip samples across the fault zones contained, in order, 0.057 and 0.030 ppm gold, 0.943 and <0.3 ppm silver, <5 ppm to 0.011% arsenic, 0.16% and 0.33% barium, and <50 ppm to 0.19% copper.
*59	Unknown	Clear comb quartz and limonite-filled fractures cut schist and granodiorite. Fractures trend N. 20° W. and dip 40° E., and are enveloped by quartz-clay-sericite alteration, some limonite, and weak bleaching.	One 25-ft-long open cut and a 50-ft-long bulldozer cut.	One chip and one grab sample. Grab sample of granadiorite contained 0.156 ppm gold and <0.3 ppm silver. The 1-ft chip sample of quartz-filled fractures contained 0.133 ppm gold, <0.3 ppm silver, and 0.19% barium.
*60	Missouri group (placer)	Located in 1895. Small creek contains deposits of gravel in channels in metamorphic bedrock.	One pit.	One grab sample: no gold detected.
*61	Denio Basin group	Veinlets and small lenses of chalcedony in altered basalt and andesite can be traced for 100 ft, trend N. 55° W. and dips 65° E. to vertical, and contain a trace of cinnabar and clay minerals. Host rocks are altered to clay with some silicification near veins. Williams and Compton (1953) observed chrysocolla, malachite, and schwatzite.	One caved shaft, one caved adit estimated to be 100 ft long, one open adit 30 ft long, and two 240 ft long dozer cuts.	Five grab and four chip samples; grab samples of dump rock ranged from 0.019 to 0.055 ppm gold and <0.3 to 0.560 ppm silver. Chip samples of veins ranged from 0.027 to 0.078 ppm gold, <0.3 ppm silver, 47 to 126 ppm mercury [Williams and Compton (1953, p. 47) indicate samples from this prospect contain a trace to 8.6 lb of mercury per ton], and 0.014% to 0.052% barium. Other concentrations of interest in both chip and grab samples included 18 ppm molybdenum, 110 ppm copper, 4 to 10 ppm antimony, 31 ppm arsenic, and 75 to 670 ppm mercury.
*62	Unknown	Talus of white quartz and schist. Quartz is opaque to semi-translucent. Schist is weakly bleached and altered to chlorite and clay with minor silicification. Limonite is present on fractures in quartz and occasionally in the schist.	Four bulldozer cuts.	Five grab samples of quartz and schist float. Gold values ranged from <0.007 to 10.78 ppm; silver values ranged from <0.3 to 1.938 ppm.

TABLE 1.--Mines, prospects, mining claims, and claim groups in and adjacent to the Pueblo Mountains study area, Oregon and Nevada--Continued

Map no. (plate 1)	Name (commodity)	Summary	Workings and production	Sample and resource data
*63	Gray Eagle	A 100-ft-long zone contains narrow (<1 in. thick) opaque, white quartz veinlets in schist. Veinlets trend N. 40° E. and dip 70° E., approximately parallel to schistosity. The schist is strongly bleached for 1 to 2 ft on either side of the veins; the contact zones also contain limonite, clay, and sericite alteration.	No workings.	One random chip sample of altered schist contained 0.029 ppm gold and <0.3 ppm silver.
*64	Unknown	Quartz float near schist outcrop. Quartz is opaque white with occasional clear quartz veinlets and a trace of cinnabar on some fractures. The schist is moderately bleached with clay, sericite, and silica alteration.	One pit.	One grab sample of quartz stockpile contained 0.059 ppm gold, <0.3 ppm silver and 21 ppm molybdenum.
*65	Unknown	Schist, altered to clays and bleached, is cut by clear to opaque quartz veins which contain a trace of pyrite. Quartz is present in dump material.	One caved adit estimated to be about 70 ft long.	One grab sample of dump rock contained 1.310 ppm gold, 1.057 ppm silver, 5 ppm arsenic, 11.4 ppm antimony, 140 ppm zinc, 550 ppm copper, and 85 ppm molybdenum.
*66	Denio Mtn. Iron.	A zone of magnetite as thick as 3 ft and about 100 ft long, parallels banding in a gray schist. The host rock is a pale gray to black hornblende schist with varying magnetite content. In places, the magnetite appears to have replaced other minerals; the magnetite-rich band trends N. 65° W. with a near-vertical dip. The schist is in contact with granodiorite; the granodiorite is cut by a few opaque white quartz veinlets and is locally silicified.	One trench 3 ft wide, 30 ft long and 3 ft deep and one pit.	One grab and one chip sample. The grab sample of granodiorite contained no detectable precious metals or trace elements. The three ft chip sample of magnetite contained 8% iron, 0.53 ppm gold, and <0.3 ppm silver.
*67	Sulfide group	A quartz vein cuts schist. The vein quartz is opaque white with local comb structure, trends N. 5° to 10° E. and dips 70° to 90° E. The schist is bleached and altered to clay with local areas of silicification near fractures. Near the south end of the group, an intensely bleached, iron-stained clay altered zone is exposed for 1500 ft along Denio Creek; only a trace of pyrite was observed. This prospect was core drilled in the mid-1970's by a major minerals exploration company as a porphyry copper prospect. Two holes were drilled to approximately 700 ft depth each, but no data is available.	Three bulldozer cuts, two shafts, and one caved adit.	Eight grab and four chip samples. Seven dump rock grab samples ranged from <0.007 to 1.547 ppm gold and <0.3 to 10.54 ppm silver. One stockpile grab sample ranged from 4.037 ppm gold and 3.984 ppm silver. All four chip samples are of schist and range from <0.007 to 1.547 ppm gold and <0.3 to 17.31 ppm silver. Other concentrations of interest in chip and grab samples included as much as 0.178% arsenic, 75 ppm antimony, 0.047% barium, 0.17% copper, and 240 ppm molybdenum.

TABLE 2.--Sample data for samples of mineralized areas in or adjacent to the Pueblo Mountains study area, Oregon and Nevada

[Tr, trace; N, none detected; --, not analyzed; <, less than shown]
[Asterisk (*) indicates outside study area]

Sample (Plate 2)	Type	Length (ft)	Description	Gold (ppm)	Silver (ppm)	Mercury (ppm)	Arsenic (ppm)	Antimony (ppm)	Barium (%)	Lead (ppm)	Zinc (ppm)	Copper (ppm)	Molybdenum (ppm)
1	Chip--	12.0	Unaltered tuff-------------------------------	<0.007	<0.3	<2	2	<2	0.104	<30	21	<2	<1
2	do----	8.0	Unaltered welded tuff-----------------------	<.007	<.3	<2	2	<2	.124	<30	27	<2	<1
3	do----	4.0	Unaltered rhyolite/latite-------------------	<.007	<.3	<2	2	<2	.120	<30	51	<2	<1
4	Grab--	--	Unaltered rhyolite with minor quartz---------	<.007	<.3	<2	2	<2	.108	<30	58	<2	<1
5	Chip--	15.0	Unaltered basalt with quartz in some vesicules---------------------------------	<.007	.590	<2	4	<2	.111	<30	60	89	<1
6	do----	20.0	Unaltered basalt-----------------------------	.082	<.3	2	2	<2	.131	<30	52	<2	<1
7	do----	20.0	do---	<.007	<.3	<2	2	<2	.122	<30	51	<2	<1
8	Random chip--	--	Unaltered basalt-----------------------------	.067	<.3	<2	<2	<2	.167	<30	29	<2	<1
9	do----	--	do---	<.007	<.3	<2	2	<2	.128	<30	44	<2	<1
10	do----	--	Unaltered vesicular basalt-------------------	<.007	<.3	<2	3	<2	.027	<30	64	200	<1
11	Channel	1.6	Basalt with clay alteration and calcite in some fractures----------------------------	.085	.350	<2	2	<2	.085	<30	42	52	20
12	Chip--	3.0	Unaltered dark gray basalt outcrop-----------	.016	<.3	<2	2	<2	.096	63	68	60	21
13	do----	1.0	Unaltered quartz latite outcrop--------------	<.007	<.3	<2	2	<2	.082	<30	33	<2	11
14	do----	2.0	Unaltered ash flow tuff----------------------	<.007	<.3	<2	2	<2	60 ppm	<30	74	<2	5.3
15	do----	--	Unaltered tuff-------------------------------	<.007	<.3	<2	3	<2	80 ppm	<30	72	<2	<1
16	do----	--	Unaltered basalt-----------------------------	<.007	<.3	<2	3	<2	.111	<30	37	<2	<1
17	do----	--	do---	<.007	<.3	<2	3	<2	.115	<30	36	<2	<1
18	do----	--	Unaltered rhyolite---------------------------	<.007	<.3	<2	3	<2	.101	<30	32	<2	<1
19	Random chip--	3.0	Outcrop of vesicular basalt with surficial iron oxide staining------------------------	<.007	<.3	<.2	110	<2	.04	<80	110	130	<2
20 [1]	do----	4.0	Outcrop of dark brown, diktytaxitic andesite with surficial iron oxide and joints which strike N. 45° W. and N. 85° E. and dip vertically--------------------------------	.017	<.3	2	650	9.5	.04	<80	<2	<5	16

TABLE 2.--Sample data for samples of mineralized areas in or adjacent to the Pueblo Mountains study area, Oregon and Nevada--Continued

Sample													
(Plate 2)	Type	Length (ft)	Description	Gold (ppm)	Silver (ppm)	Mercury (ppm)	Arsenic (ppm)	Antimony (ppm)	Barium (%)	Lead (ppm)	Zinc (ppm)	Copper (ppm)	Molybdenum (ppm)
21	Select grab--	--	Aphanitic, dark brown basalt float with surficial iron-oxide staining---------------	0.013	<0.3	<2	<2	4	0.013	<80	<2	<5	<2
22	Grab--	--	Float of scoriaceous basalt with opaque to clear quartz amygdules------------------	<.007	<.3	<2	<2	<2	<.01	<80	<2	<5	<2
23	do----	--	Natrolite and opaque white quartz float scattered on porphyritic basalt-------------	.017	<.3	<2	<2	<2	.142	<80	42	<5	<2
24	Chip--	2.0	Fine-grained, friable granodiorite dike which cuts vesicular basalt-----------------	.055	<.3	<2	5	<2	.089	<30	60	300	<1
25	do----	5.0	Moderately to intensely fractured zone strikes N. 13° W. and dips vertically in dark gray, porphryritic basalt-----------	<.03	<1	<2	<20	<.20	.04	<80	73	120	<2
26	do----	5.0	Zone of medium-textured, friable rhyolite hosted in vesicular basalt. The zone strikes N. 10° W., and dips 34° SW.---------	<.007	<.3	<2	2	<2	.086	<30	24	190	<1
27	Grab--	--	Dark gray, finely crystalline basalt with blebs of iron oxide--------------------	.012	<.3	<2	<2	4	.013	<80	120	130	<2
28	Grab--	--	Moderately altered, silicified intrusive with limonite and sericite in a host of basalt----------------------------------	<.007	<.3	<2	2	<2	.021	<30	<1	<2	<1
29	Random chip	5.0	Outcrop sample of fine-grained amygdaloidal basalt with calcite and naturolite cavity filling. Occasional malachite stain----------------------------	<.007	<.3	<2	2	<2	90 ppm	<30	46	160	<1
30	Select	--	Fine to coarse (<1/4 in. to 4 in. diameter) fragments of white and blue chalcedony scattered on surface of vesicular and amygdaloidal basalt-------------------------	.012	<.3	<2	<2	<2	<50 ppm	<80	<2	<5	<2

TABLE 2.--Sample data for samples of mineralized areas in or adjacent to the Pueblo Mountains study area, Oregon and Nevada--Continued

Sample (Plate 2)	Type	Length (ft)	Description	Gold (ppm)	Silver (ppm)	Mercury (ppm)	Arsenic (ppm)	Antimony (ppm)	Barium (%)	Lead (ppm)	Zinc (ppm)	Copper (ppm)	Molybdenum (ppm)
31	Chip--	4.0	Outcrop of dark brown porphyritic and amygdaloidal basalt with chalcedony filled vesicles, malachite coatings and thin (1/4 in. thick) veinlets of calcite.	0.032	<0.3	<2	<2	<2	0.034	<80	75	130	<2
32	Grab--	--	Fine-grained andesite and granodiorite float with opaque, white quartz veinlets and limonite----------------------------------		<.3	<.2	<2	<2	--	<80	<2	<5	<2
33	Chip--	20.0	Twenty ft thick, opaque white quartz zone of veins traceable for 50 ft; strikes N. 40° E., dips vertically and has minor surficial limonite----------------------------------		<.3	<.2	<2	<2	--	<80	<2	<5	<2
34	Grab--	--	Red to brown jasper float near unaltered basalt outcrop.	.102	<.3	<.2	40	<2	--	<80	<2	<5	24
35	do----	--	Float of scoria from basalt flow top---------	<.007	<.3	<2	2	<2	.125	<30	68	<2	<1
36	do----	--	Outcrop of unaltered rhyolite flow-----------	<.007	<.3	<2	2	<2	.209	<30	63	28	<1
37	do----	--	Unaltered grayish brown dacite outcrop-------	<.007	<.3	<2	2	<2	.097	<30	30	<2	<1
38	do----	--	Unaltered grayish white tuff outcrop contains as much as 20% clastic material less than 2 in. across-------------------------------	<.007	<.3	<2	2	<2	.017	<30	11	<2	<1
39	do----	--	Opaque quartz, unaltered basalt, and argillized quartz monzonite float-----------	.069	<3	<2	<2	<2	--	<80	<2	<5	<2
*40	do----	2.0	Across outcrop of quartz monzonite with clay, sericite, and silicification type alterations.	.079	<.3	<2	<2	<2	--	<80	<2	<5	<2
41	Grab--	--	Red to brown jasper float near unaltered basalt outcrop------------------------------	.102	<.3	<2	40	<2	--	<80	<2	<5	24

[1] Assay results also indicated 2.5 ppm U_3O_8.

TABLE 3.--Pan 1/ samples in the Pueblo Mountains study area, OR and NV

[N, not detected]

Map no.	Description	Gold content	
		(oz/yd^3) (X 10 -5)	(\$/yd^3) @ \$300/oz
1	South Fork Field Creek; 2-4 ft wide, 6-12 in. deep 2/; gravel contains basalt, andesite, and trace opaque quartz all of which are angular to subangular. Nearby bedrock is amydgaloidal basalt; 20% > 1/4 in.	2.80	$0.008
2	Sesena Creek; 2-3 ft wide, 6-8 in. deep; gravel consists of subangular to subrounded basalt, andesite, and minor clear quartz; 25% > 1/4 in.	N	N
3	North Fork Sesena Creek; 3 ft wide, 3 in. deep; gravel has subangular to angular volcanics including dacite, basalt, and andesite, some chalcedony, and fragments of clear quartz crystals; 40% > 1/4 in.	1.20	.0036
4	Unnamed creek; dry, 4 ft wide; gravel includes some opaque quartz with occasional malachite and subangular to subrounded basalt; 20% > 1/4 in.	17.3	.052
5	Horse Creek; 2 ft wide, 6 in. deep; gravel contains trace clear and opaque quartz, andesite and basalt - all fragments are subangular to subrounded; 35% > 1/4 in.	4.02	.012
6	Willow Creek; 4-7 ft wide, 1-3 ft deep; gravel includes minor opaque quartz, fine-grained volcanics, silicified fine-grained volcanics - a few pieces have clear quartz, malachite, and azurite on fractures; gravel is angular to subangular with 40% > 1/4 in.	16.0	.048

TABLE 3.--Pan 1/ samples from the Pueblo Mountains study area, OR and NV--Continued

Map no.	Description	Gold content	
		(oz/yd^3) (X 10 -5)	(\$/yd^3) @ \$300/oz
7	Unnamed creek; dry; gravel has fine grained volcanics including andesite, tuff and basalt but no quartz; all fragments subangular to subrounded; 20% > 1/4 in.	2.01	\$0.006
8	Little Cottonwood Creek; dry; gravel includes subrounded fine grained volcanics but no quartz; 50% > 1/4 in.	4.02	.012
9	Arizona Creek; 2 ft wide, 1/2 - 1 ft deep; gravel contains trace opaque quartz and volcanics - all are subangular; about 75% > 1/4 in.	2.01	.006
10	Catlow Creek; 1-3 ft wide, 1/2 ft deep; gravel contains some opaque quartz, trace clear quartz, some tourmalinized silicified float, trace epidote; gravel is mainly subangular to subrounded rhyolite and tuff; 50% of gravel is > 1/4 in.	2.01	.006
11	Unnamed creek; 2 ft wide, 1/2 - 1 ft deep; gravel includes trace opaque quartz, some andesite and diorite trace rhyolite; some has tourmaline, epidote, and chalcedonic quartz; gravel is subangular to subrounded; 30% - 40% >1/4 in.	2.80	.008
12	Oliver Creek; 3 ft wide, 3 ft deep; gravel includes trace opaque quartz, diorite, tuff, and silicified volcanics; all gravel subangular to subrounded, 40% - 50% >1/4 in.	4.02	.012
13	Colony Creek; 3-5 ft wide and 6 in. deep; gravels include opaque and clear quartz, and angular to subrounded phyllite; 35%-40% >1/4 in.	N	N

TABLE 3.--Pan 1/ samples from the Pueblo Mountains study area, OR and NV--Continued

Map no.	Description	Gold content (oz/yd^3) (X 10 -5)	Gold content ($/yd^3) @ $300/oz
14	Cherry Creek; 1-1/2 ft wide, 6 in. deep; gravel includes opaque quartz and epidote, and angular to subrounded phyllite; 25%-30% >1/4 in.	0.80	$0.0024
15	Van Horn Creek 8 ft wide, 1 ft deep; occasional milky quartz and float with epidote. Rock fragments subangular metamorphics; 5% > 1/4 in., collected at an eddy on outside of curve of creek.	5.22	.0157
16	Stonehouse Creek; 3-4 ft wide and 6-10 in. deep; no quartz; gravel contains basalt and andesite subangular to subrounded; no quartz; 40% > 1/4 in.	N	N
17	Modesto Creek; 2-3 ft wide and 2-5 in. deep; gravel no quartz; consists of angular volcanics; 50% >1/4 in.	3.2	.0096
18	Rough Canyon; 1-2 ft wide and 6 in. deep; no quartz; gravel is subrounded to subangular volcanic material, 40% >1/4 in.	2.8	.008
19	Unnamed creek; 2 ft wide, 6-8 in. deep; gravel is subangular andesite and basalt but no quartz; 50% >1/4 in.	2.8	.008
20	Unnamed creek; dry; gravel is subangular to angular basalt and andesite with no quartz; 40% >1/4 in.	1.2	.0036
21	Dip Creek; 2 ft wide, 6 in. deep; no quartz; gravel consists of andesite and vesicular basalt, 50% >1/4 in.	5.0	.016

TABLE 3.--Pan 1/ samples from the Pueblo Mountains study area, OR and NV--Continued

Map no.	Description	Gold content (oz/yd^3) (X 10 -5)	Gold content ($/yd^3) @ $300/oz
22	Dugout Creek; 2 ft wide and 6 in. deep; no quartz; gravel is subangular volcanic rocks, primarily andesite and basalt; 50% >1/4 in.	4.3	$0.013
23	Unnamed creek; 1 ft wide and 5 in. deep; gravel contains basalt and andesite but no quartz; 25% > 1/4 in.	N	N
24	Unnamed creek; 3 ft wide, 3 in. deep; gravel contains vesicular and non-vesicular basalt but not quartz. Fragments are angular to subangular with 35% > 1/4 in.	4.02	.012

1/ Each sample represents two 14 in. pans level full which equals 0.008 cubic yards.
2/ Dimensions of active portion of stream bed excluding flood stage.

RENO RESEARCH LABORATORY DETECTION LIMITS

Element	Preferred procedure 1/ 2/	Detection limits, ppm
Ag	FA or FA/ICP	1.7 or 0.3
Al	ICP	10 3/
As	AA or ICP	100; 2 4/ or 200
Au	FA or FA/ICP	0.17 or 0.007
B	ICP	10
Ba	ICP or X-ray	5 or 200
Be	ICP	0.2
Bi	ICP or AA	100 or 100
Br	X-ray	50
C	Chem	10
Ca	AA or ICP	100 or 200
Cd	ICP or AA	1 or 3
Cl	Chem or X-ray	100 or 100
Co	ICP or AA	2 or 10
Cr	ICP or AA	4 5/ or 50 5/
Cs	AA	10
Cu	ICP or AA	6 or 5
F	Chem	10
Fe	ICP or AA	5 or 10
Ga	X-ray or ICP	200 or 200
Ge	X-ray	100
Hf	X-ray	200
Hg	Special or X-ray	2 or 100
I	X-ray	100
In	AA	2 4/
Ir	FA/Spec	0.017
K	AA or ICP	10 or 200
La	ICp or Spec	5 or 100
Li	ICP or AA	10 or 10
Mg	AA or ICP	3 or 100
Mn	ICP or AA	0.5 or 5
Mo	ICP or AA	5 or 30
Na	AA or ICP	10 or 300
Nb	ICp or X-ray	10 or 50
Ni	ICP or AA	5 or 10
Os	FA/ICP	0.003
P	ICP or Chem	200 or 5
Pb	AA or ICP	30 or 30
Pd	FA/ICP	0.02
Pt	FA/ICP	0.02
Rb	AA	10
Re	AA	5 4/
Rh	FA/Spec	0.003
Ru	FA/Spec	0.017
S	Chem	20
Sb	AA or ICP	300; 2 4/ or 50
Se	AA or X-ray	100; 4 4/ or 100
Si	ICp or X-ray	100 3/ or 1,000
Sn	AA or X-ray	5 4/ or 200

RENO RESEARCH LABORATORY DETECTION LIMITS--Continued

1/ 2/

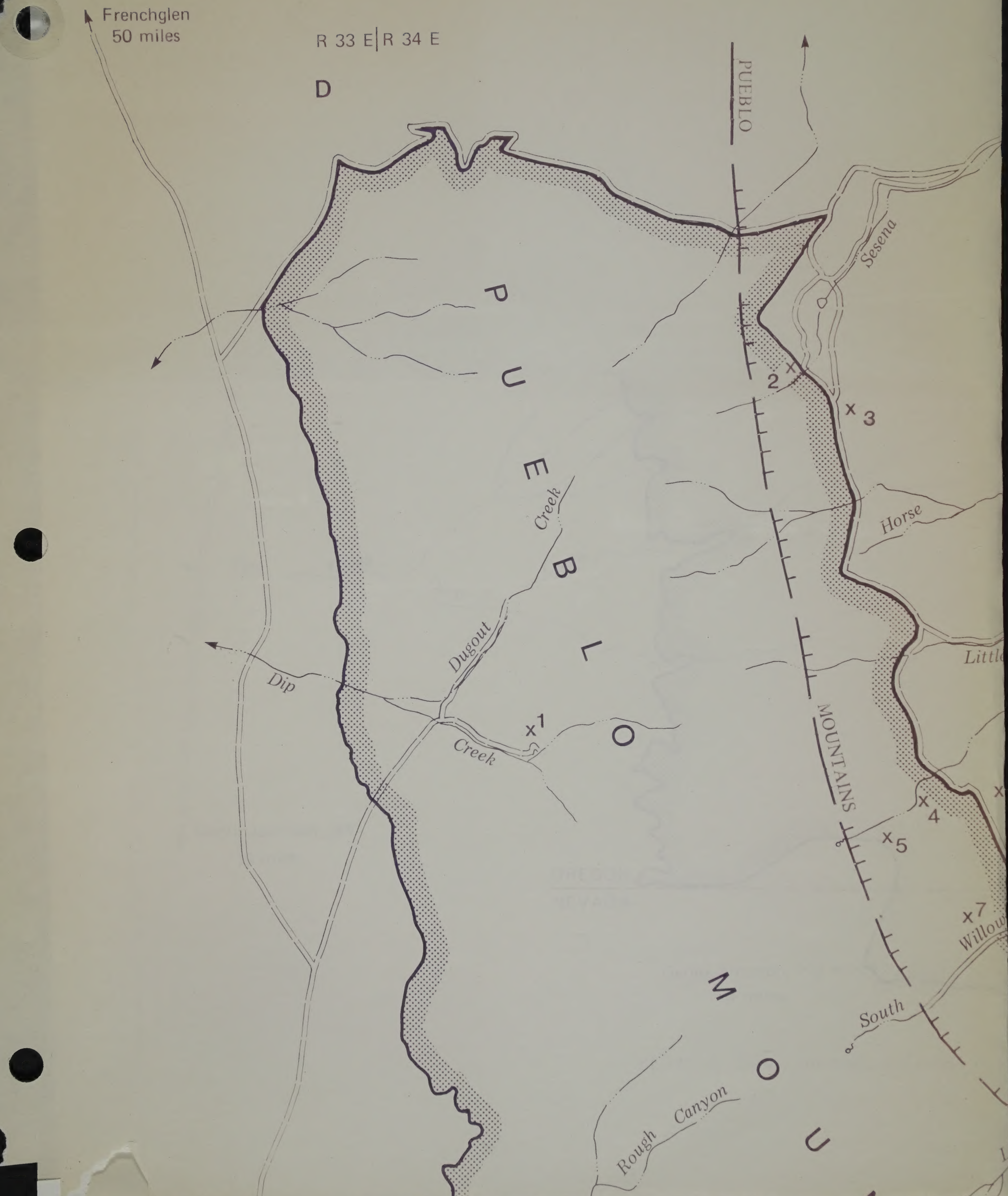
Element	Preferred procedure	Detection limits, ppm
Sr	ICP or AA	0.5 or 10
Ta	X-ray	100
Te	AA or X-ray	100; 2 4/ or 100
Th	Radiometric	50
Ti	ICP or X-ray	100; 2 4/ or 100
Tl	AAS or X-ray	2 4/ or 200
U	Special or radiometric	0.5 or 20
V	ICP	5
W	Special or X-ray	5 or 200
Zn	ICP or AA	5 or 5
Zr	ICP or X-ray	20 or 100
Rare earths	Spec	varies about 100 ppm
Nitrates, sulfates, etc.	Chem	varies

1/ The preferred procedure depends upon the detection limit required, matrix, and other elements requested.

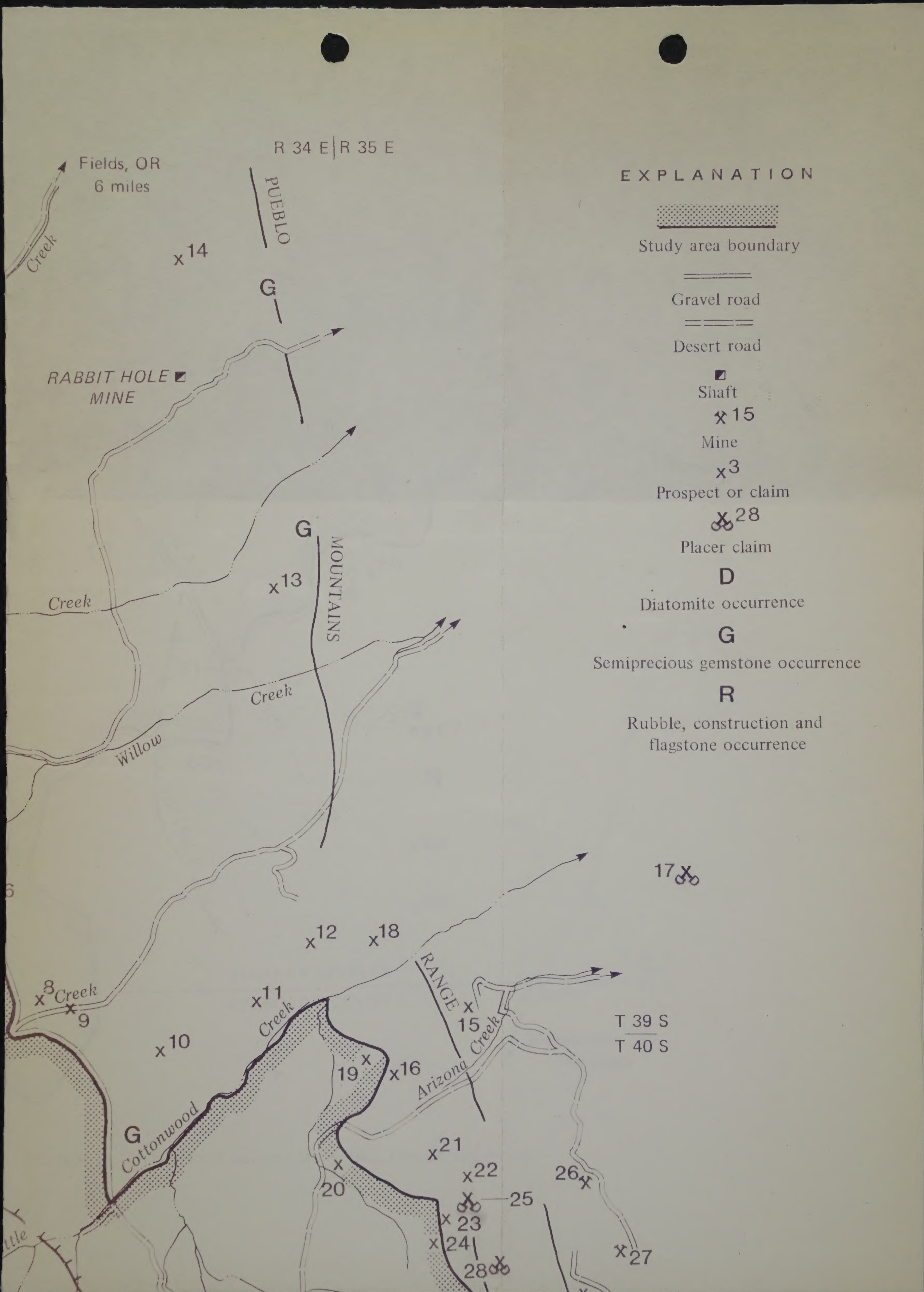
2/ AA--Atomic adsorption spectrophotometry.
Chem--Wet chemical procedure.
FA--Standard fire assay.
FA/ICP--Fire assay combined with ICP measurement on dore bead.
FA/Spec--Fire assay combined with emission spectrographic measurement.
ICP--Induction coupled plasma-atomic emission spectrometry.
Spec--Emission spectrography.
Special--Specific chemical or instrumental procedure developed for one element.
X-ray--X-ray fluorescence.

3/ See "whole rock procedure".
4/ Specific extraction procedure.
5/ See "chromite procedure".

PLATE 1.--Mines, prospects, and claims in and adjacent to the Pueblo Mountains study area, Oregon and Nevada



Frenchglen
50 miles
R 33 E | R 34 E
D
PUEBLO
P U E B L O
M O U
PUEBLO
MOUNTAINS
Sesena
Horse
Little
Willow
South
Rough Canyon
Creek
Dugout
Dip
Creek
x 1
2
x 3
x 4
x 5
x 7



R 34 E | R 35 E
Fields, OR
6 miles
Creek
PUEBLO
x 14
G
RABBIT HOLE
MINE
G
MOUNTAINS
x 13
Creek
Creek
Willow
6
x 12
x 18
x 8
Creek
x 9
x 11
Creek
RANGE
x 15
Arizona Creek
x 10
19 x
x 16
G
Cottonwood
x 21
x 22
x 20
26 x
25
x 23
x 24
28
x 27
17
T 39 S
T 40 S
ttle
EXPLANATION
Study area boundary
Gravel road
Desert road
Shaft
15
Mine
x 3
Prospect or claim
28
Placer claim
D
Diatomite occurrence
G
Semiprecious gemstone occurrence
R
Rubble, construction and flagstone occurrence

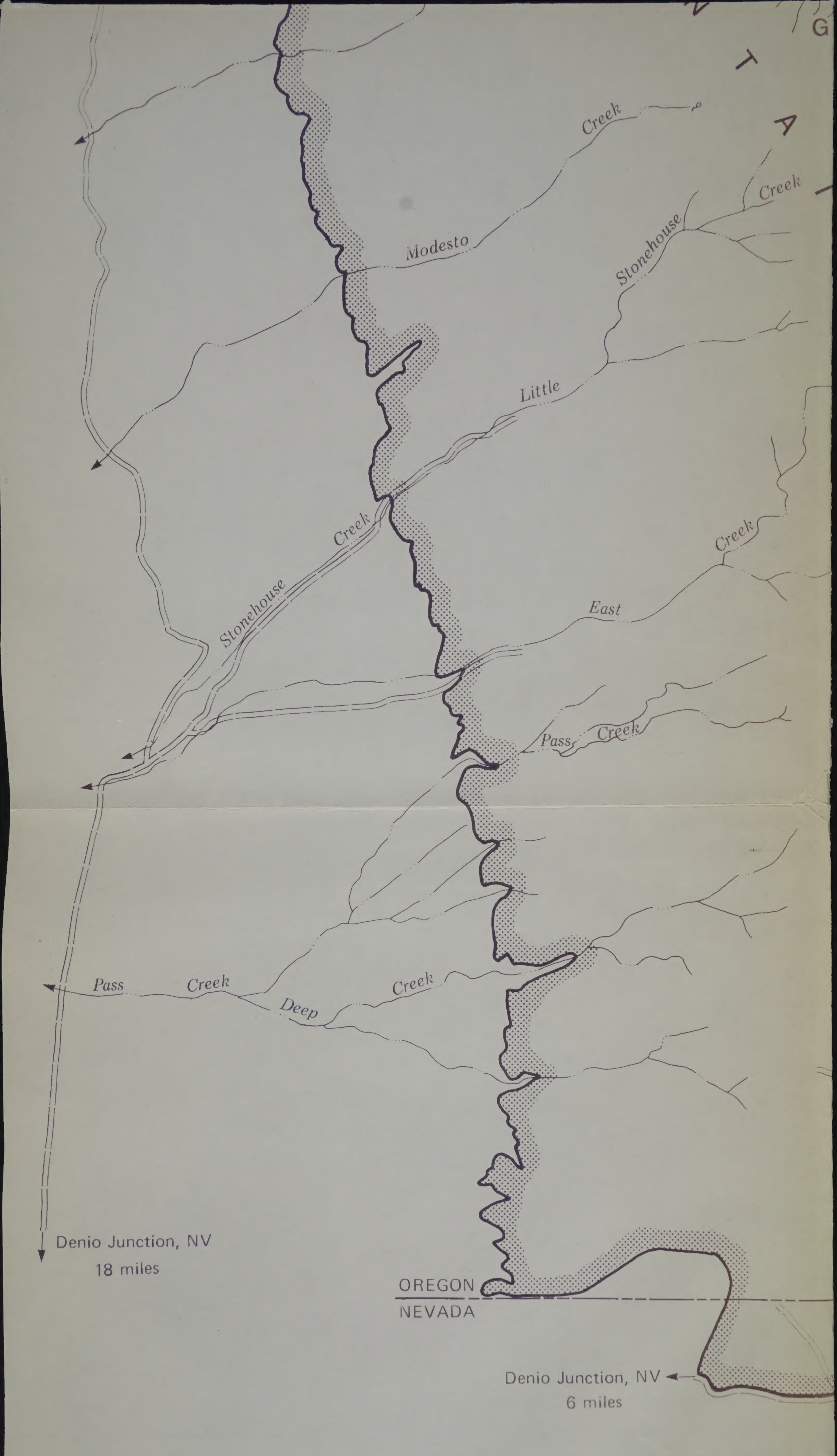
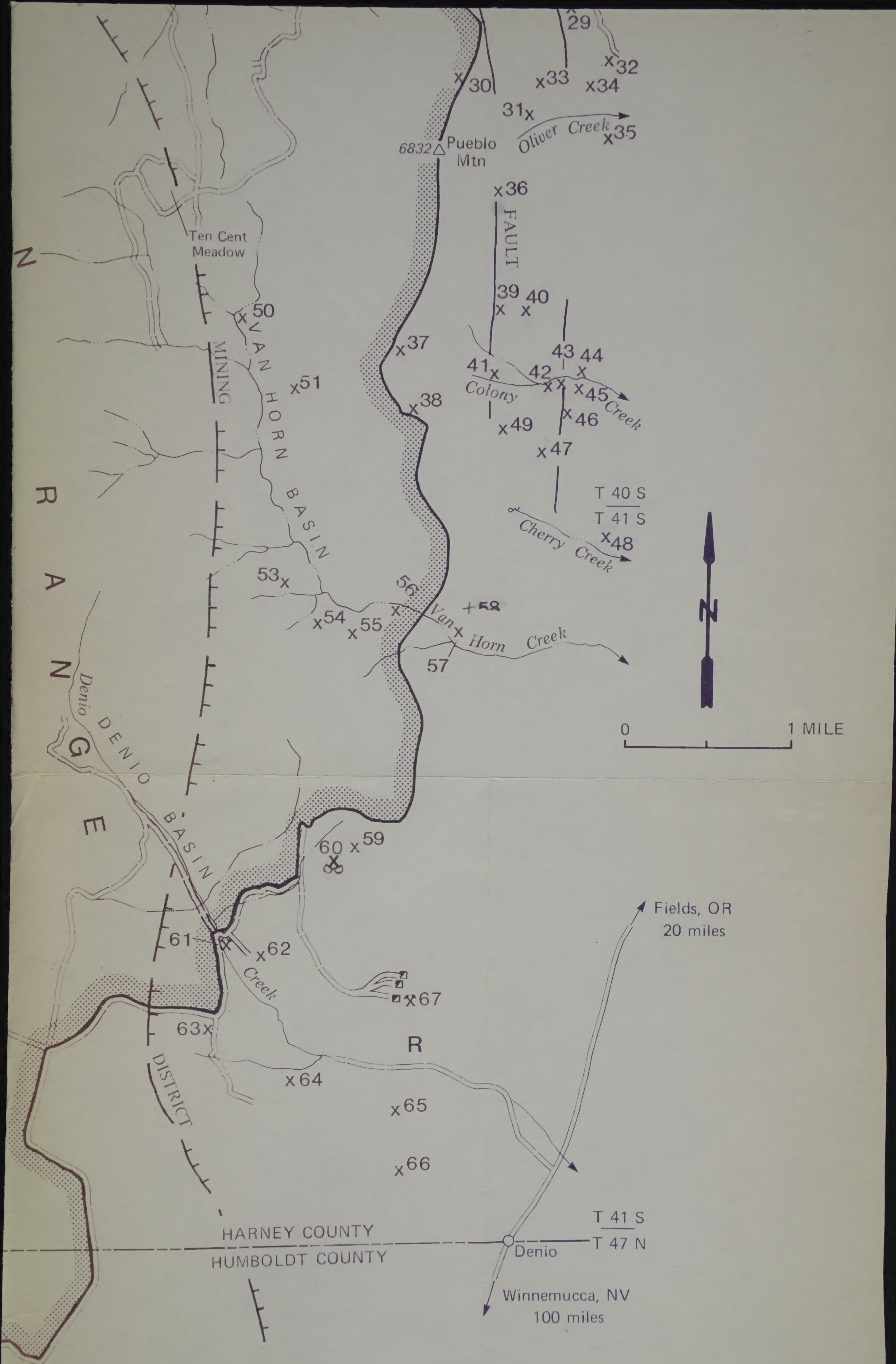
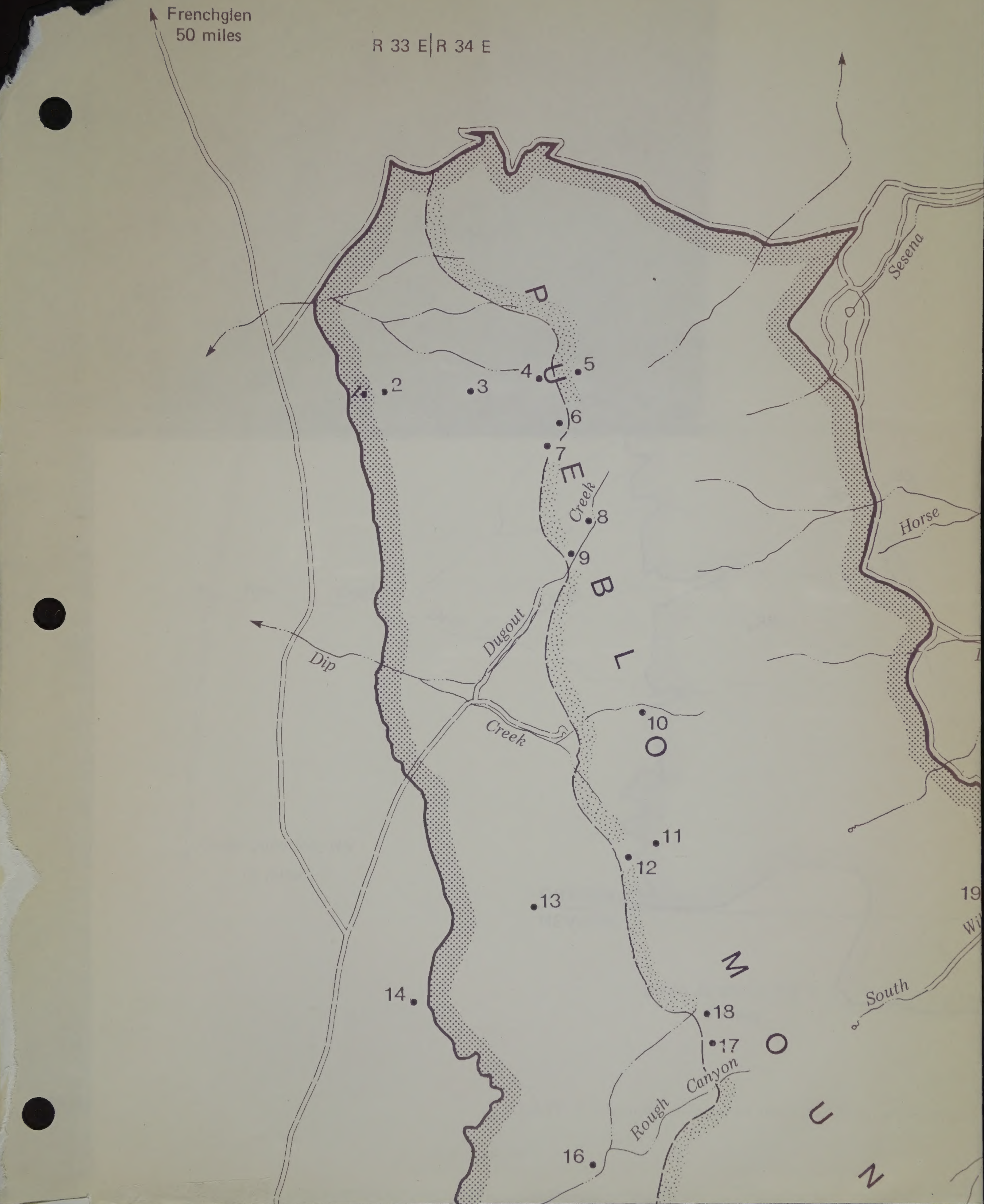


PLATE 1.—Mines, prospects, and claims in a

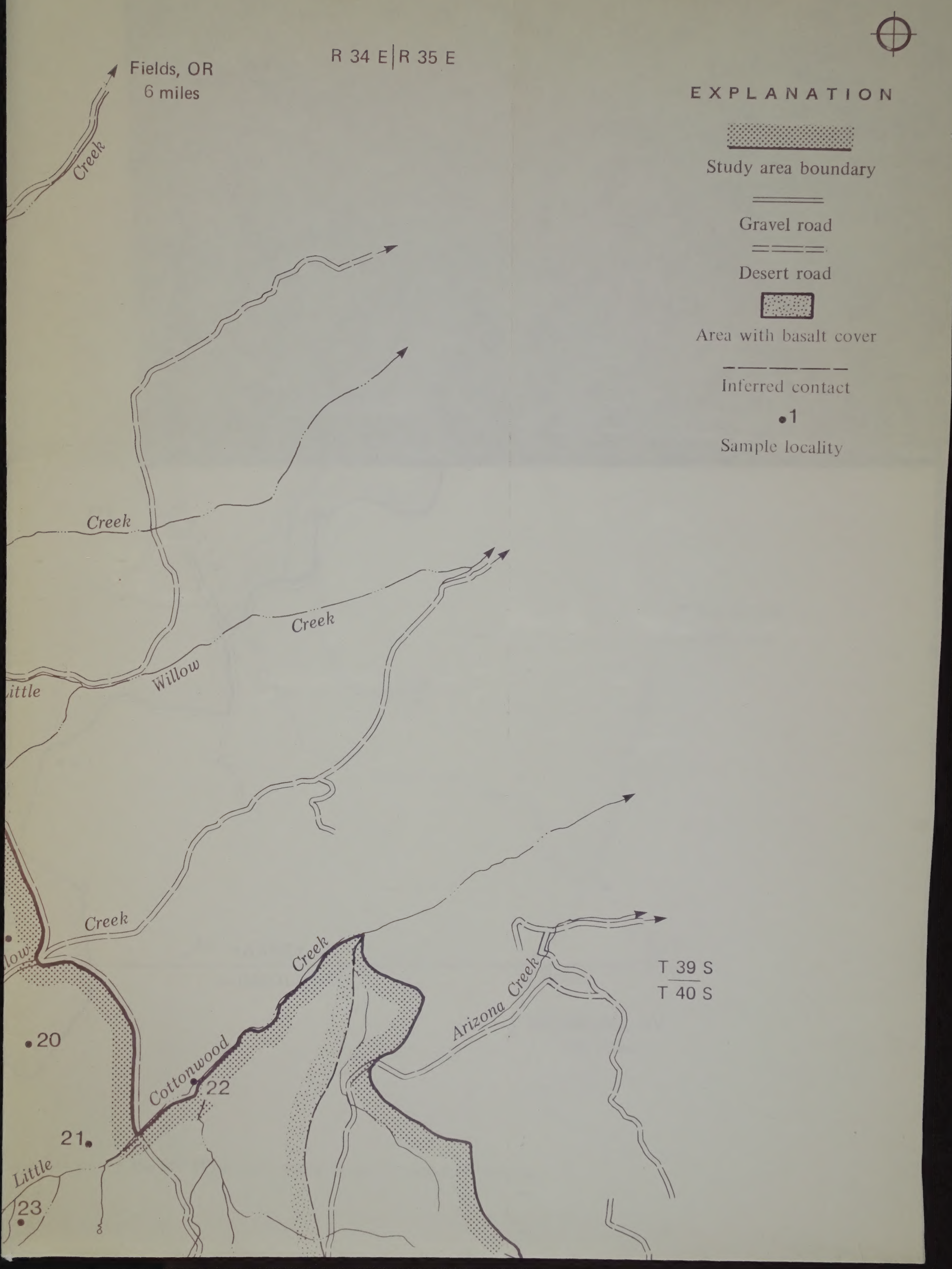


nd adjacent to the Pueblo Mountains study area, Oregon and Nevada

PLATE 2.– Sample location of the mineralized areas in and adjacent to the Pueblo Mountains study areas, Oregon and Nevada



Frenchglen
50 miles
R 33 E
R 34 E
Sesena
P U E B L O
M O U N
Creek
Horse
Dugout
Dip
Creek
South
Rough
Canyon
1
2
3
4
5
6
7
8
9
10
11
12
13
14
16
17
18
19


R 34 E | R 35 E
Fields, OR
6 miles
EXPLANATION
Study area boundary
Gravel road
Desert road
Area with basalt cover
Inferred contact
1
Sample locality
Creek
Creek
Creek
Willow
Little
Creek
Cottonwood
Creek
Arizona Creek
Little
20
21
22
23
T 39 S
T 40 S

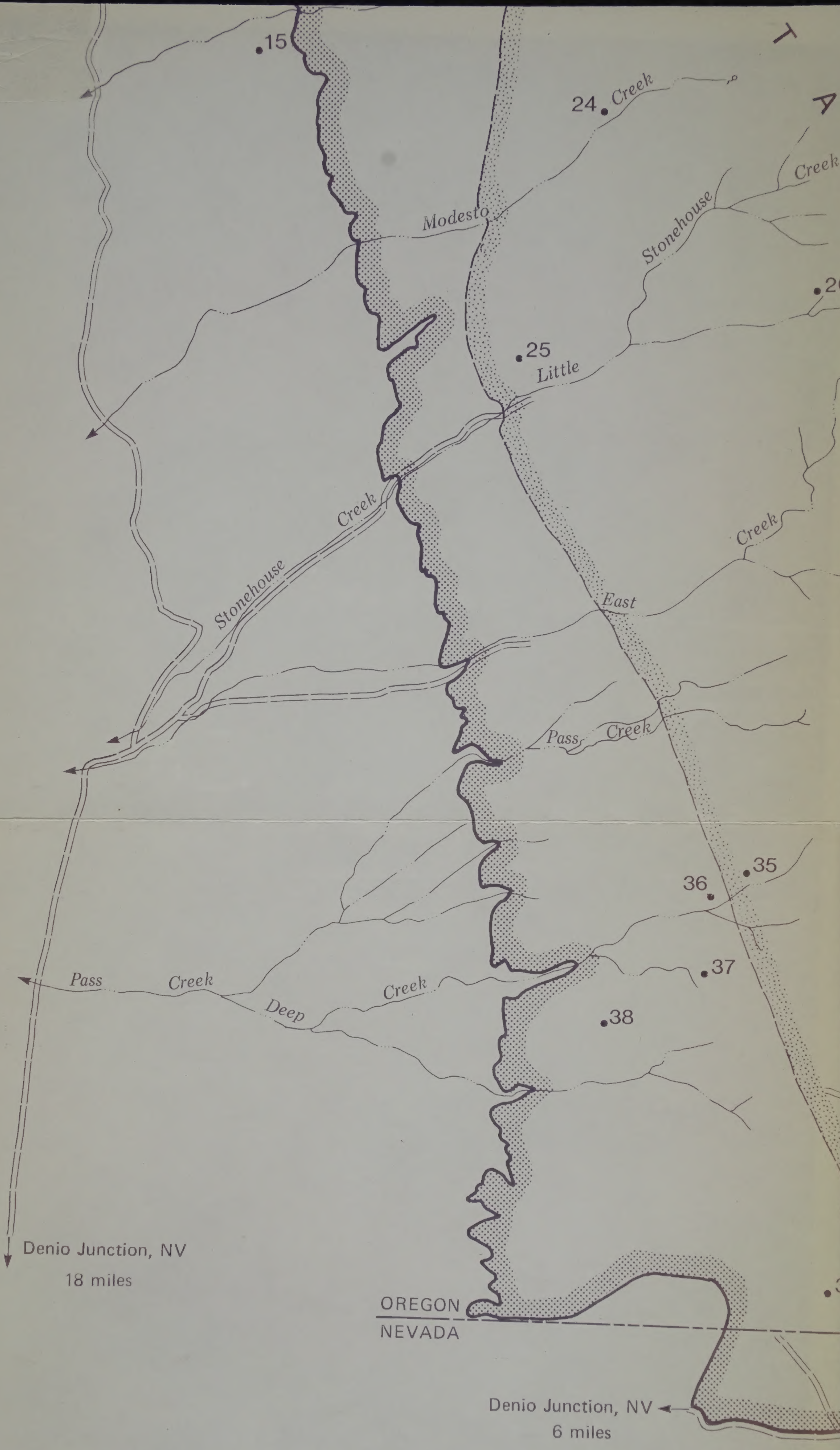
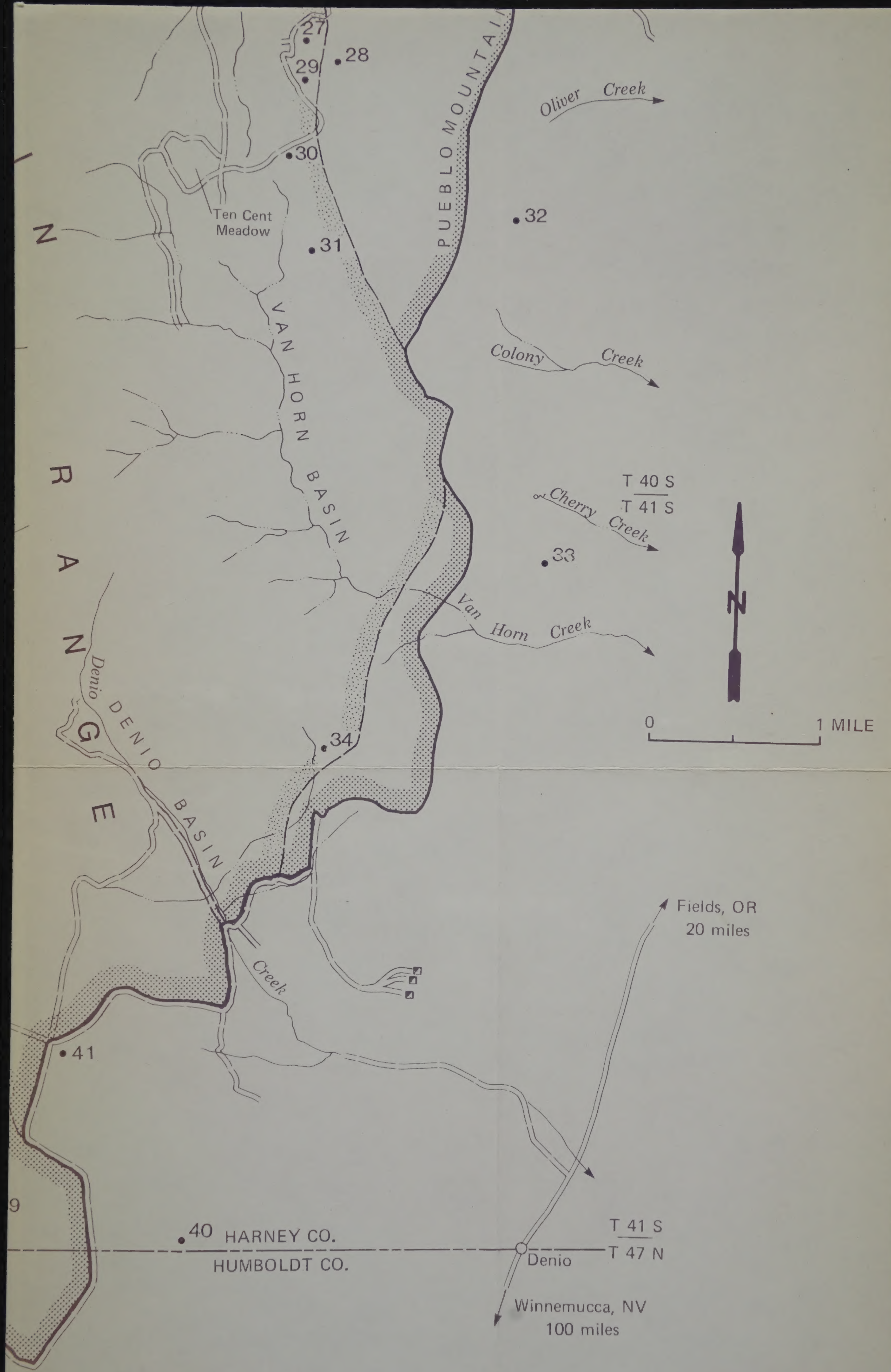


PLATE 2.– Sample location of the mineralized areas in and



adjacent to the Pueblo Mountains study areas, Oregon and Nevada

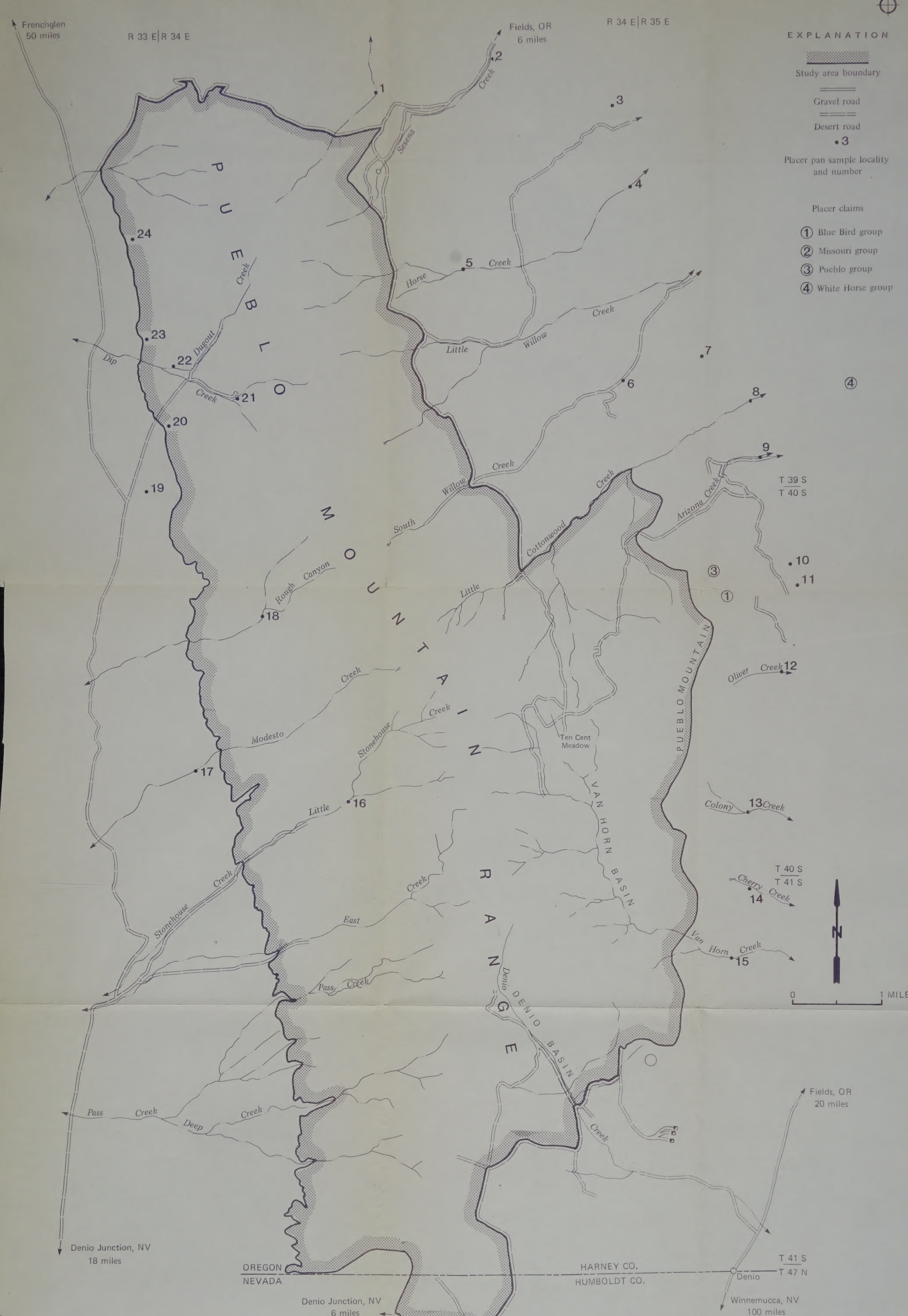
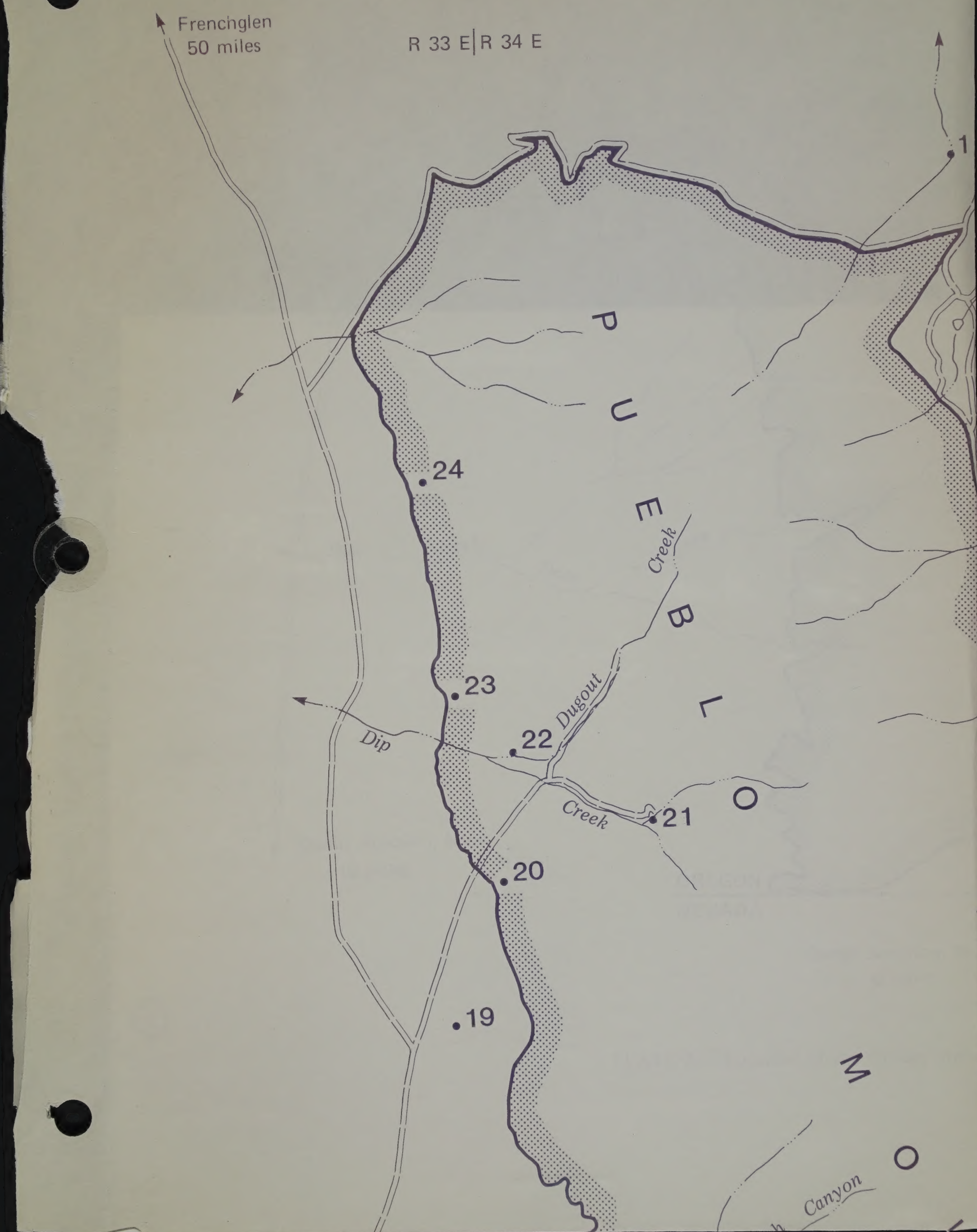
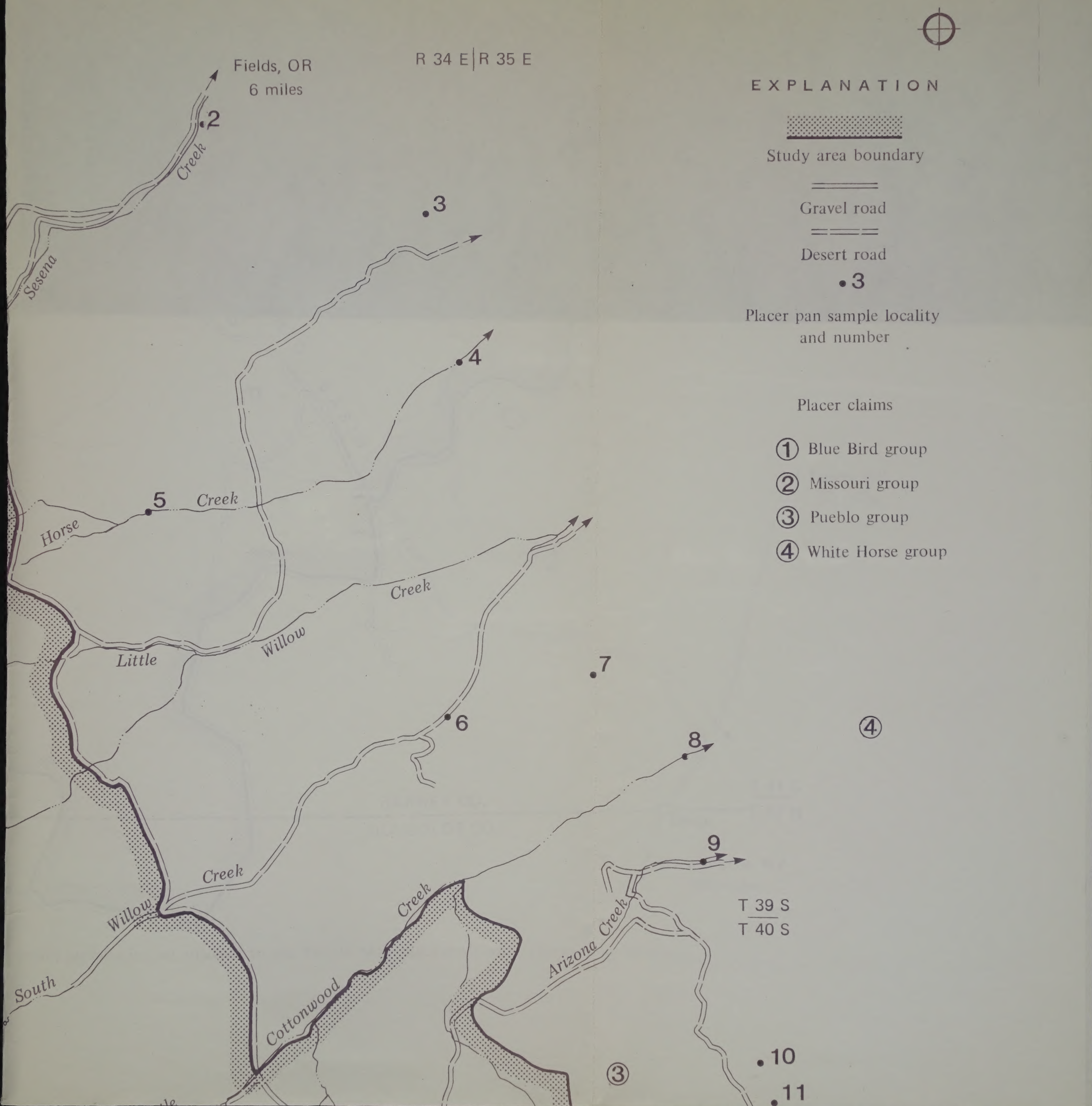


PLATE 3.– Location of the panned stream gravel samples in and adjacent to the Pueblo Mountains study area, Oregon and Nevada



Frenchglen
50 miles
R 33 E | R 34 E
P U E B L O
M O
Creek
Dugout
Dip
Creek
Canyon
1
24
23
22
21
20
19



Fields, OR
6 miles
R 34 E
R 35 E
EXPLANATION
Study area boundary
Gravel road
Desert road
3
Placer pan sample locality and number
Placer claims
① Blue Bird group
② Missouri group
③ Pueblo group
④ White Horse group
2
Creek
3
Sesena
4
5
Creek
Horse
Creek
Willow
Little
7
6
④
8
9
T 39 S
T 40 S
Creek
Willow
South
Creek
Arizona Creek
Cottonwood
10
③
11

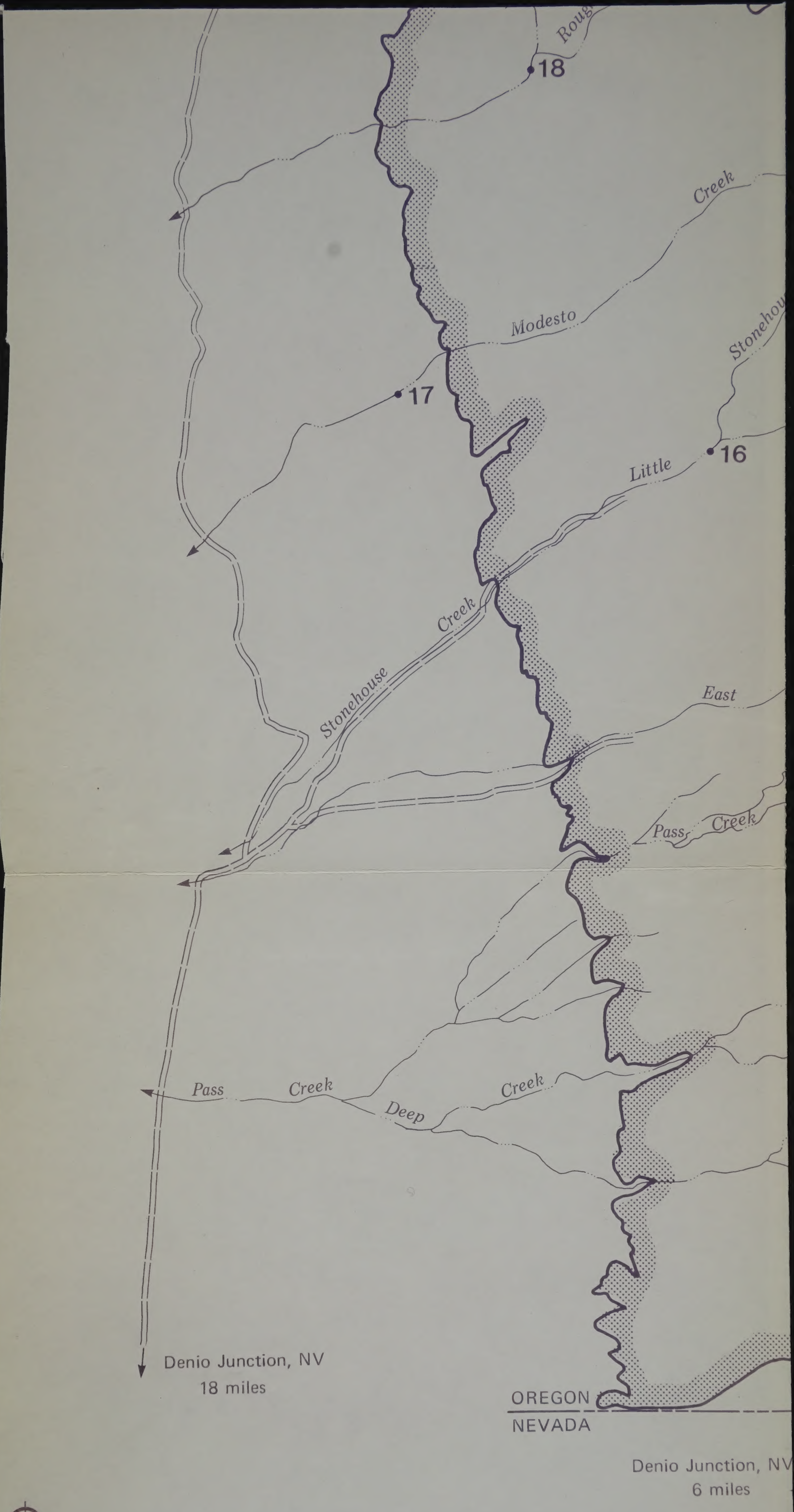
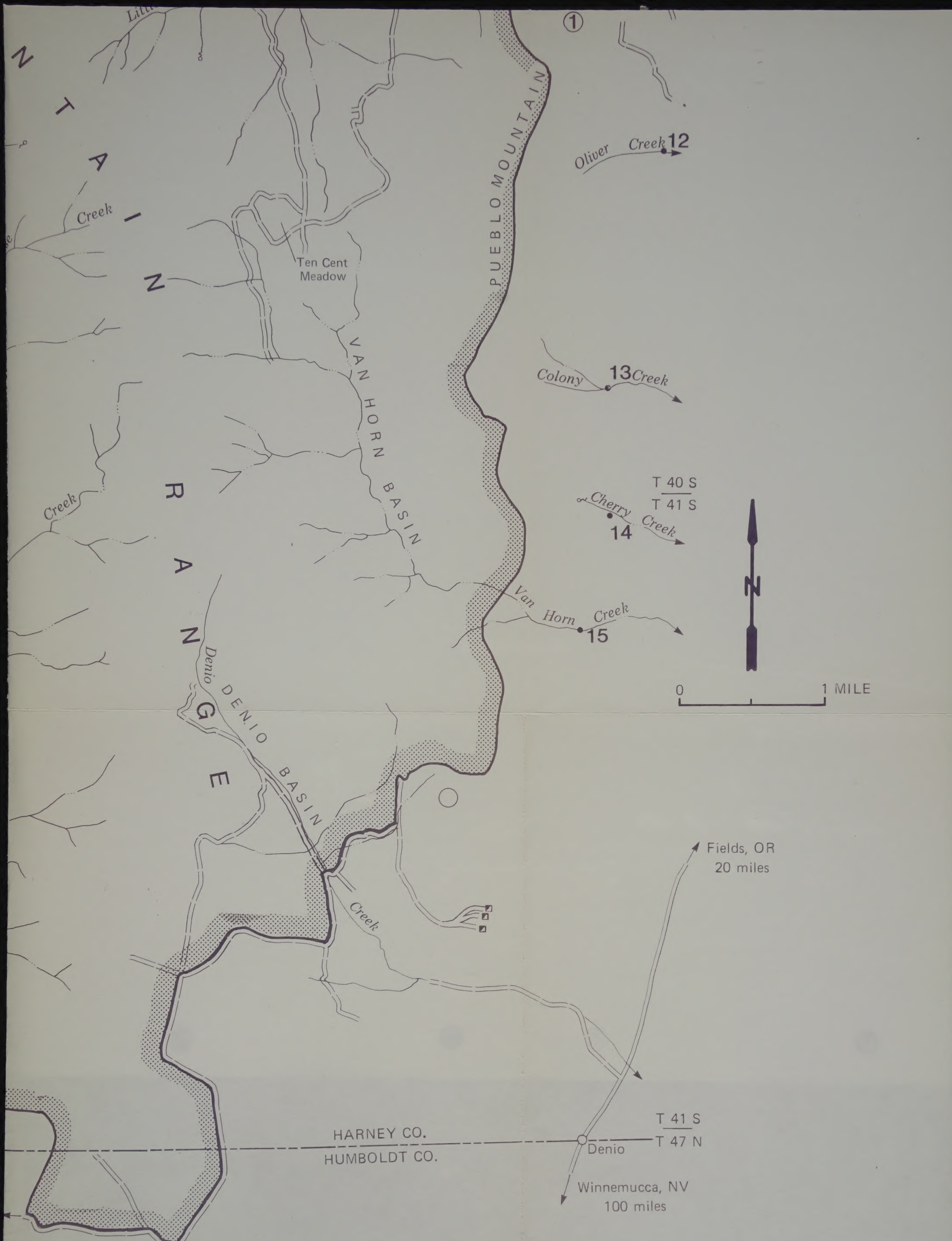


PLATE 3.– Location of the panned strea



n gravel samples in and adjacent to the Pueblo Mountains study area, Oregon and Nevada